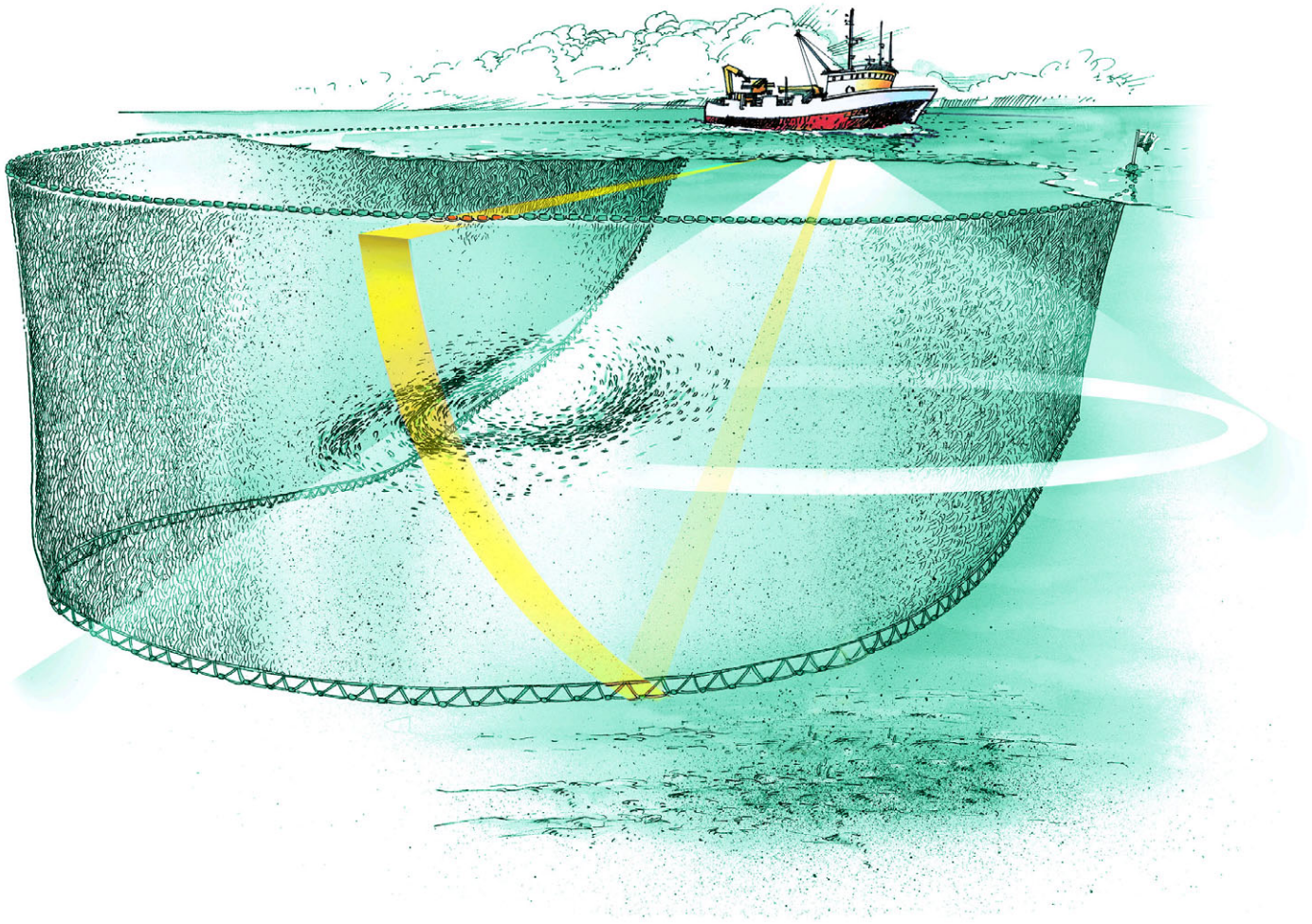
Installation manual

Simrad SP60
Low frequency fishery sonar



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SIMRAD
A KONGSBERG Company

Simrad SP60

Low frequency fishery sonar

WARNING

The sonar must never be powered up when the ship is in dry dock. The transducer will be damaged if it transmits in open air. To prevent inadvertent use of the sonar, pull out the mains plug on the Sonar Processor Unit whenever the vessel is in dry dock.

851-164574 / Rev.C

Note

Simrad AS makes every effort to ensure that the information contained within this document is correct. However, our equipment is continuously being improved and updated, so we cannot assume liability for any errors which may occur.

Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment or injury to personnel. The user must be familiar with the contents of the appropriate manuals before attempting to operate or work on the equipment.

Simrad AS disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

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Support

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Sections

This document is the Installation manual for the Simrad SP60 sonar system. It provides the information and technical specifications necessary to install the various system components.

1 Introduction (Page 1)

2 Installation planning (Page 22)

3 Installation of the Sonar Trunk (Page 29)

4 Installation of the Hull Unit (Page 34)

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Remarks

References

Further information about the SP60 system may be found in the following manuals:

- SP60 Operator manual

The reader

This Installation manual is intended for the design and installation engineers at the shipyard performing the installation. The information is supplied as the basis for the shipyard's own installation drawings applicable to the vessel. On completion of the installation, this manual must be kept on the vessel for reference purposes during system maintenance.

Additional copies

Additional copies of this manual may be ordered from Simrad AS quoting the book's order number 851-164574. It can also we ordered in major bookstore quoting the ISBN number 82-8066-006-2.

An electronic version in PDF format may be obtained from Simrad AS or any of our distributors.

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Document revisions

Rev	Date	Written by	Checked by	Approved by
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B	02.04.02	RBr	SØJ	SØJ
C	26.08.03	RBr	SØJ	SØJ
D				
E				
F				
G				

(The original signatures are recorded in the company's logistic database.)

Rev.A First edition for SP60.

Rev.B Removed brake release screw from hull unit drawings.

Rev.C Implemented new Sonar Processor Unit MC70 and new Sonar Interface Unit.

To assist us in making improvements to the product and to this manual, we would welcome comments and constructive criticism. Please send all such - in writing or by Email - to:

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Notes

High voltage safety warning

Precautionary measures

The voltages used to power this equipment are potentially lethal. Even 110 volts can kill. Whenever possible, the following precautionary measures must be taken before any work is carried out inside the equipment:

- Switch off all high-voltage power supplies.
- Check the operation of any door interlocks and any other safety devices.
- Completely discharge all high-voltage capacitors.

It should be noted that interlocks and safety devices are normally located only at regular access points, and high voltages may be exposed during dismantling.

Never work alone on high-voltage equipment!

First aid in the event of electric shock

Normally, even a high voltage electric shock will not kill instantly. The victim can still be revived even when his breathing and heart-beat have ceased.

Could YOU save someone's life?

In the event of electric shock, the correct actions, performed quickly may well save the victim's life. Make sure you know what to do!

Immediate action

While shouting for help, remove the source of power from the victim. Switch off the supply if possible, or using a dry, non-conductive material (rubber gloves, broom handle etc.) to insulate yourself, separate the victim from the source. If the voltage exceeds 1000 volts, switch off the supply and be ready to catch the victim. Take care- do not become a victim yourself.

Commence first aid on the spot. Continue to shout for assistance till someone arrives.

1 Lay the victim flat on his back and loosen any tight clothing (collar, tie, belt etc.).

2 Open his mouth and check for and remove any false teeth, chewing gum etc.

3 Check if the victim is breathing. If not, check if his heart is beating. The pulse is normally easily found in the main arteries of the neck, either side of the throat, up under the chin.

If his heart is beating but he is not breathing, commence artificial respiration. If the victim's heart is not beating, commence external cardiac massage (ECM). Continue to shout for assistance till someone arrives.

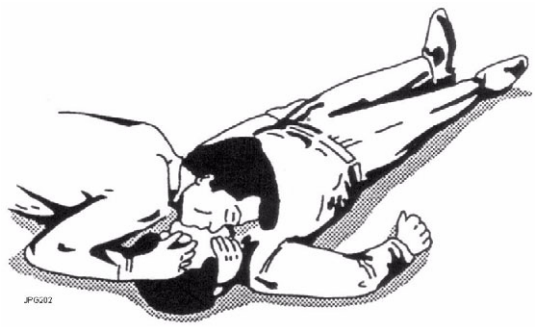
External cardiac massage

1 Kneel beside the victim. Place the heel of one hand in the centre of his chest, at a position half way between the notch between the collar-bones at the top of his chest, and the dip in the breast-bone at the base of his rib cage. Place the other hand on top of the first.

2 Keeping the arms straight and using your entire weight, press down rapidly so that the breast bone is depressed four- five cm, then release the pressure. Repeat rhythmically at a rate of one cycle per second. This will be hard work, but keep going. His life depends on YOU. Do not worry about breaking his ribs - these will heal if he survives.

Artificial respiration

1 Kneel besides the victim's head. Place one hand under his neck and lift, allowing his head to fall back. This will lift his tongue and open the air passage in his throat.
2 Place the palm of the hand on his forehead to maintain the "chin-up" position.
3 Using the index finger and thumb of the same hand, pinch the victim's nostrils closed. Open his mouth.
4 Take a deep breath and cover his mouth with yours. Blow steadily into his lungs to expand his chest. Remove your mouth from his to allow the air to escape from his chest. You should be able to see his chest deflate.
5 Repeat the "inflation-deflation" cycle at a rate of about 12 cycles per minute till the victim begins to breath normally again.



Combining ECM and artificial respiration

If you are alone, perform **one** cycle of artificial respiration for every **five** cycles of ECM. This will be hard work, but keep going. His life depends on you!

If there are other people available to help, one should perform the ECM while one performs the artificial respiration for every five cycles of ECM. It will be much more efficient with two people.

Once the victim's heart is beating and he is breathing, roll him onto his side and support him in that position. As consciousness returns he may vomit, and this will allow any liquid to drain out of his mouth.

Remove the victim to a hospital as soon as possible, but do not interrupt the artificial respiration and ECM cycles till his heart beat and breathing returns.

If started quickly and performed correctly, the resuscitation methods described will keep a sufficient volume of oxygenated blood flowing trough the victims body to allow full recovery.

Proficiency in the resuscitation methods can only be achieved trough training. All personnel concerned should attend courses on a regular basis. Remember, someone's life could depend on you.

Do you know what to do?

1 INTRODUCTION

1.1 Purpose and description

Introduction

The purpose of this manual is to provide the information and basic drawings required for installation of the Simrad SP60 sonar system.

These instructions must be followed carefully to ensure optimal sonar performance. As a guide, installation procedures are presented in the order they are to be performed. Successful completion of each procedure is to be confirmed by checking-off the corresponding box.

After installation, this document should be stored on board the vessel for later reference when updating or servicing the equipment.

Note

The installer is responsible for the equipment during the installation. The guarantee is only valid when the installation is made in accordance with this manual.

Installation procedures

Installation procedures for the standard Simrad SP60 sonar system can be grouped under the following main categories:

→ *Installation planning, page 22.*
→ *Installation trunk, page 29.*
→ *Hull Unit, page 34.*
→ *Transceiver Unit, page 42.*
→ *Wheelhouse Units, page 46.*
→ *Cabling, page 55.*
→ *Peripheral equipment, page 75.*
→ *Start-up procedures, page 87.*
→ *Testing the peripheral equipment, page 124.*
→ *Final tests and measurements, page 138.*

1.2 System diagram

A simplified SP60 system diagram is shown.

Legend:

(A) = Colour display

(B) = Keyboard

(C) = Sonar Processing Unit

(D) = Sonar Interface Unit

(E) = Loudspeaker

(F) = Multiple interface lines to peripheral equipment

(G) = Transceiver Unit

(H) = Hull Unit

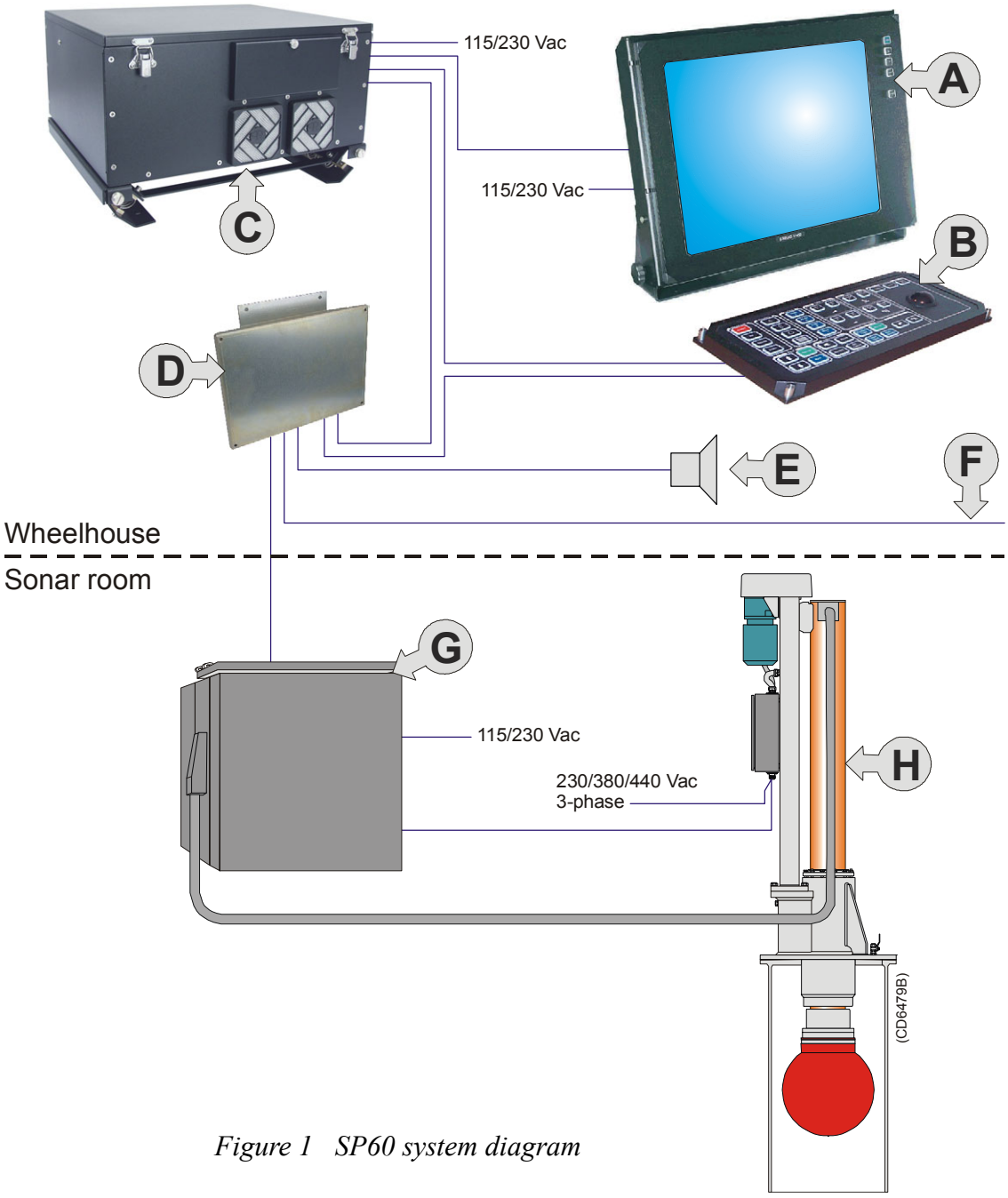


Figure 1 SP60 system diagram

1.3 Scope of supply

Main units

The standard Simrad SP60 sonar system is comprised of the following main units:

Unit	Order number
Operating Panel	SH8-203593
Sonar Processor Unit	SP6-207893
Sonar Interface Unit	SP7-207891
Transceiver Unit	SP6-205770
SP60 Hull Unit	SP6-205740

Note

The display unit is not included in the standard delivery, but may be ordered as an option. Refer to Display Unit *below for more information.*

→ *Refer to page 150 for more information concerning weights and dimensions of the various units.*

General

The Simrad SP60 Sonar system is delivered without a dome system. The hull unit employs a Simrad SQ4 installation trunk allowing the SP60 to be mounted in existing SQ4, SR 240 or SP270 trunks.

Note

The Simrad SP60 installation trunk is not included in the standard delivery. It may be fabricated by the shipyard, or supplied by Simrad as an option. (Refer to Options *below for more information.)*

The optional trunk supplied by Simrad is approved by Det Norske Veritas (DNV) and includes a blind cover and gasket. The drawings of the trunk and blind cover are included in the drawing file.

→ *Refer to the Sonar trunk drawing 830-113361 on page 194.*

→ *Refer to the Blind cover drawing 830-113362 on page 195.*

Options

The following options may be ordered at an additional charge to augment the standard Simrad SP60 sonar system delivery.

Hull Unit

The standard SP60 Hull Unit can be lowered 1.0 meters at a speed of 15 knots.

The following option is available:

Hull Unit	Specifications	Order number
SP61	1.2 m / 24 knots	SP6-207349

Installation trunk

The installation trunk may be fabricated by the shipyard or supplied by Simrad:

Unit	Order number
SP60 / SP61 Installation trunk	SQ4-042508

Display unit

The SP60 sonar requires a VGA or DVI colour display with a resolution of at least 1280 x 1024 pixels. A 19-inch LCD may be ordered from Simrad. An optional mounting kit must be ordered for desktop installations.

Unit	Order number
19-inch LCD monitor, AC version	298-078946
Desktop mounting kit	598-078951

Gyro interface

If the course gyro data is not available on a standard NMEA 0183 serial line, a gyro interface box is required.

Unit	Order number
LR40 Gyro interface unit	298-078535

Frequency

The SP60 can be configured to operate on triple or multiple frequencies. This feature is especially helpful in suppressing interference from other sonars.

Unit	Order number
Triple frequencies	KIT-203993
Multiple frequencies	KIT-203994

Interface for scientific applications

This Ethernet interface include outputs of sonar beam data, sonar settings and processed target data.

Unit	Order number
Scientific interface	KIT-203477

1.4 Peripheral equipment

Required inputs

The Simrad SP60 sonar system requires input from both a speed log and a course gyro. Inaccurate data from either of these instruments will result in an incorrect indication of vessel and target movement.

Speed log

The speed log parameters are:

- Pulse log: 200 pulses / nm.
- Serial line, standard NMEA 0183, RS-232

→ *Also refer to (D)GPS below.*

Course gyro

The course gyro parameters are:

- Serial line, standard NMEA 0183, RS-232

An optional gyro interface box for converting the following synchro and stepping gyro signals can be ordered from Simrad:

- 3-phase synchro signal, 20 to 150 V L-L, 50/60/400 Hz, gear ration 1:360 or 1:180
- 3-phase stepper signal, 20 to 150 V L-L, gear ration 1:360 or 1:180

→ *Refer to page 5 for the Simrad order number.*

Additional inputs

In addition to the pulse log input described above, the SP60 sonar provides a total of seven RS-232 serial lines. Since one is used to interface the course gyro, the remaining six serial lines may be used for:

- Differential Global Positioning System - (D)GPS
- Echo sounder
- Purse seine system
- Trawl system
- Current meter system
- Radio buoy system

Differential Global Positioning System - (D)GPS

A (D)GPS may be interfaced with the Simrad SP60 sonar to establish the vessel's position and provide cursor and marker latitude and longitude.

Note that in addition to navigational data, the (D)GPS may also be used for the input of speed log information. Most (D)GPS are equipped to present course information, but this data is generally too inconsistent to provide a stable sonar presentation.

The (D)GPS parameters are:

- GPS data: RS-232 Serial line, standard NMEA 0183.

Echo sounder

To provide depth information on the catch control page of the sonar's display, echo sounders may be connected:

- RS-232 Serial line, standard NMEA 0183

Purse seine system

To provide purse seine depth information on the sonar's display, the following Simrad purse seine system may be connected:

- Simrad PI30 Purse seine system (RS-232)

Trawl system

To provide trawl information on the sonar's display, one of the following Simrad trawl systems may be connected:

- Simrad FS903 Trawl sonar system (RS-232)
- Simrad FS3300 Trawl sonar system (RS-232)
- Simrad ITI Integrated Trawl Instrumentation system (RS-232)

Current meter system

A current meter system may be connected to the sonar to display the direction and speed of the sea currents on various depths. The following current system can be connected:

- Kaijo DCG-200

The current meter system is interfaced by means of an RS-232 serial line.

Radio buoy system

A GPS based radio buoy system may be connected to the sonar to show the position and buoy data on the display. The following buoy systems can be connected:

- SERPE
- Ariane
- Ryokusei

All are interfaced by means of an RS-232 serial line.

1.5 Supply conditions

Purpose

The following supply conditions are applicable to standard Simrad SP60 deliveries and associated optional equipment.

Equipment responsibility

The shipyard performing the installation and/or dealer becomes fully responsible for the equipment upon receipt unless otherwise stated in the contract.

The duration of responsibility includes:

- The period of time the equipment is stored locally before installation.
- During the entire installation process.
- While commissioning the equipment.
- The period of time between commissioning and the final acceptance of the equipment by the end user (normally the owner of the vessel which the equipment has been installed).

The Simrad SP60 system guarantee period (as specified in the contract) begins when the acceptance documents have been signed unless other arrangements have been made in the contract.

Receipt, unpacking and storage

Upon accepting shipment of the equipment, the shipyard and/or the dealer should ensure that the delivery is complete and inspect each shipping container for evidence of physical damage. If this inspection reveals any indication of crushing, dropping, immersion in water or any other form of damage, the recipient should request that a representative from the company used to transport the equipment be present during unpacking.

All equipment should be inspected for physical damage, i.e. broken controls and indicators, dents, scratches etc. during unpacking.

If any damage to the equipment is discovered, the recipient should notify both the transportation company and Simrad so that Simrad can arrange for replacement or repair of the damaged equipment.

Once unpacked, the equipment must be stored in a controlled environment with an atmosphere free of corrosive agents, excessive humidity or temperature extremes. The equipment must be covered to protect it from dust and other forms of contamination when stored.

→ *Refer to page 152 for more information concerning environmental tolerances.*

1.6 General safety rules

The system operates on 115 and/or 230 / 380 / 440 Vac, 50/60 Hz.

WARNING **This voltage can be lethal.**

The following safety precautions must be followed at all times during installation and maintenance work:

- Always switch off all power before installation or maintenance. Use the main circuit breaker, and label the breaker with a warning sign that informs others that maintenance or installation work is being carried out on the system.
- Read and understand the first aid instructions for electric shock.
- For safety reasons during troubleshooting on the equipment with power ON, two persons should always be present.
- Whenever maintenance is carried out, it is essential that a first aid kit is available, and that the maintenance personnel are familiar with the first aid instructions for electrical shock.
- The various parts of the system are heavy. Make sure that the appropriate tools and certified lifting equipment are available, and that the personnel are trained in installation and maintenance work.

1.7 Installation requirements

Responsibility and approval

The Simrad SP60's Hull Unit sleeve has been approved by Det Norske Veritas (DNV) Classification society.

Individual Hull Unit installations must be approved on a case-by-case basis with regard to the vessel's national registry and corresponding maritime authority. The shipowner and shipyard performing the installation are responsible for obtaining installation approval.

Supply power

The supply voltage to the equipment is to be kept within ±15% of the installation's nominal voltage. Maximum transient voltage variations on the main switchboard's bus-bars are not to exceed -15% to +20% of the nominal voltage (except under fault conditions).

Simrad strongly recommends that the SP60 sonar be powered using an Uninterruptible Power Supply (UPS). The UPS should have the capacity to independently maintain power to the sonar for a minimum of 10 minutes. This ensures that the system can be switched off in a controlled manner in the event of a power failure.

Environmental requirements

Temperature and humidity

All equipment, unless otherwise specified, must be protected from temperature extremes and excessive humidity.

→ *Refer to page 152 for more information.*

Compass deviation

Once the installation is complete, the vessel must be swung with the sonar in both the operative and inoperative modes. The shipowner and captain are responsible for updating the deviation table accordingly with regard to the vessel's national registry and corresponding maritime authority.

Noise sources

The vessel's hull, rudder(s) and propeller(s) should be thoroughly inspected in dry dock prior to installation. Roughness below the water-line deformities in the shell plating and protruding obstacles can create underwater noise. These sources of turbulence must be smoothed or removed as best as possible. It is especially important that the propeller(s) is not pitted or damaged.

Dry docking

Make sure that ample clearance under the sonar trunk and/or protection blister is provided when dry docking the vessel. Avoid locating supporting blocks or structures in the vicinity of this equipment.

Note

The location of the sonar trunk and/or protection blister must be noted on the vessel's docking plan for future reference.

Wiring

The cable from the wheelhouse to the sonar room must be supported and protected along its entire length using conduits and/or cable trays. Note that the cable must not be installed in the vicinity of high-power supplies and cables, antenna cables or other possible sources of interferences.

1.8 Equipment handling

Introduction

This chapter describes how to transport, pack and unpack, clean, preserve and store electronic, electro-mechanical and mechanical units supplied by Simrad AS.

The units may be supplied as spare parts, or as parts of a delivery.

Transportation

General specifications

Unless otherwise stated in the accompanying documentation, electronic, electro-mechanical and mechanical units supplied by Simrad can be transported using all methods approved for delicate equipment; e.g. by road, rail, air or sea. The units are to be transported in accordance with general or specific instructions for the appropriate unit(s), using pallets, transport cases, or carton boxes as appropriate.

Note

Special local restrictions concerning air transportation may be applied to units containing certain types of batteries. The units should be checked and the regulations investigated by the packer/shipper before the unit is dispatched.

Local transportation

All local transportation must be carried out according to the same specifications as for the initial delivery. In general, all units must be handled with care. The carton or case containing the equipment must be kept dry at all times, and must be sheltered from the weather. It must not be subjected to shocks, excessive vibration or other rough handling.

The carton or case will normally be marked with text or symbols indicating which way up it is to be placed. Follow any instructions given and ensure the case is always placed with its “top” uppermost.

The carton or case must not be used for any purpose for which it was not intended (e.g. step, table, etc.), and in the absence of other information, no other cartons or cases must be stacked on top of it.

Lifting

A heavy crate will normally be marked with its weight, and the weights of other cartons or crates will normally be entered on the packing list.

- Always check the weight of a crate before attempting to lift it.
- Always use lifting apparatus that is certified for the load.

Heavy units may be equipped with lifting lugs for transportation by crane within the workshop or installation area. Before a crane is used, check:

- The applicable weight certificate for the crane.
- The security of the lifting lugs.

Ensure that all available lifting lugs are used. Ensure the unit remains under control during the operation to avoid damage to the unit, equipment or personnel.

Heavy units may be transported using a fork-lift truck. Special attention must then be paid to the position of the unit's centre of gravity. The units must be properly secured to the truck.

Initial preservation

Introduction

When a system, a unit or a spare part has been delivered to the customer, it may be subject to long-time storage prior to installation and use. During this storage period, certain specifications must be met.

The equipment must be preserved and stored in such a way that it does not constitute any danger to health, environment or personal injury.

Specific specifications are presented below.

→ *For further information about storage, refer to page 17.*

→ *For further information about re-packing, refer to page 19.*

→ *For further information about temperature protection, refer to page 21.*

Original packing crate

1 The equipment must be stored in its original transportation crate.

2 Ensure that the units are clearly separated in the shelves and that each unit is easily identifiable.

3 The crate must not be used for any purpose for which it was not intended (eg. work platform etc.).

4 The crates must not be placed on top of each other, unless specific markings permit this.

5 The crates must not be placed directly on a dirt floor.

6 Do not open the crate for inspection unless special circumstances permit so.

- "Special circumstances" may be suspected damage to the crate and its content, or inspections by civil authorities.
- If any units are damaged, prepare an inspection report stating the condition of the unit and actions taken. Describe the damage and collect photographic evidence if possible. Re-preserve the equipment.
- If the units are not damaged, check the humidity absorbing material. If required, dry or replace the bags, then repack the unit(s) according to the packing instructions.

7 If the crate has been opened, make sure that is it closed and sealed after the inspection.

- Use the original packing material as far as possible.

→ *Refer to the information on page 19.*

Ambient temperature and humidity

1 The storage room/area must be dry, with a non condensing atmosphere. It must be free from corrosive agents.

2 The storage area's mean temperature must not be lower than -30°C, and not warmer than +70°C.

- If other limitations apply, the crates will be marked accordingly.

Note *Transducers must not be stored in temperatures below -20*°C.

3 The crate must not be exposed to moisture from fluid leakages.

4 The crate must not be exposed to direct sunlight or excessive warmth from heaters.

Shock and vibration

1 The crate must not be subjected to excessive shock and vibration.

- Normal vibrations from vehicle, vessel or other transportation movements are permitted.

ESD precautions

→ *Refer to the information on page 20.*

Batteries

If the unit contains normal batteries, these may have been disconnected/isolated before the unit was packed. These must only be reconnected before the installation starts. Units containing batteries are marked.

Caution ***Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.***

Inspection and unpacking

Inspection

An inspection must be carried out immediately after the unit(s) have arrived at their destination.

- Check all wooden or cardboard boxes, plastic bags and pallets for physical damage. Look for signs of dropping, immersion in water or other mishandling.
- If damage is detected externally, you will have to open the packaging to check the contents.
  - Request a representative of the carrier to be present while the carton is opened, so any transportation damage can be identified.
- If any units are damaged, prepare an inspection report stating the condition of the unit and actions taken. Describe the damage and collect photographic evidence if possible. Send the inspection report to Simrad as soon as possible.
- If the units are not damaged, check the humidity absorbing material. If required, dry or replace the bags, then repack the unit(s) according to the packing instructions.

General unpacking procedure

Normal precautions for the handling, transportation and storage of fragile electronic equipment must be undertaken.

Note

If the unit is not to be prepared for immediate use, you may consider storing it unopened in its original packing material. However, it may be useful to open the case to check its contents for damage and retrieve any accompanying documentation.

- Check the carton before opening it to ensure it shows no signs of dropping, immersion in water or other mishandling.
  - If the carton shows signs of such damage, refer to the paragraph covering Inspection on receipt.
- Place the carton on a stable work bench or on the floor with the top of the carton uppermost.
- In the absence of other instructions, always open the top of the carton first. The contents will normally have been lowered into the carton from above, so this will usually be the easiest route to follow.
  - Care must be used when opening the carton to ensure the contents are not damaged.

Caution

Do not use a knife to open cardboard cartons - the contents may lie close to the surface, and may be damaged by the blade.

- If the carton has been closed using staples, remove the staples from the carton as you open it. This will reduce the possibilities of scratch injury to yourself and damage to the contents.
- If a wooden crate has been closed using screws, always remove them using a screw-driver. Do not attempt to prise the lid off with a crow-bar or similar.
- Once the carton is open, carefully remove all loose packing and insulation material. Check for manuals and other documents that may have been added to the carton during packing, and put these to one side. Check also for special tools, door keys etc.

Electronic and electro-mechanical units

Caution ***Beware of the dangers of Electro-Static Discharge (ESD) both to yourself and to the equipment, when handling electronic units and components. Refer to the precautions starting on page 20.***

Electronic and electro-mechanical units will normally be wrapped in a clear plastic bag. Lift the unit, in its bag, out of the carton and place it in a stable position on the floor/work bench.

Note *Cables must **never** be used as carrying handles or lifting points.*

Inspect the unit for damage before opening the plastic bag.

Note *Do not break the seal to open a circuit board package before the board is to be used. If the board package is returned to the manufacturers with the seal broken, the contents will be assumed to have been used and the customer will be billed accordingly.*

Assuming all is well, open the bag and remove the unit.

Open the unit and check inside. Remove any packing and desiccant material that may be inside.

Mechanical units

Mechanical units may be heavy. Using a suitably certified lifting apparatus, lift the unit out of the crate and place it in a stable position on the floor/work bench.

Note *Cables must never be used as carrying handles or lifting points.*

Inspect the unit for damage and remove any packing material that may be inside the unit.

Transducers

Transducers may be supplied mounted to a hull unit (if any), or packed separately. Crates are normally identified by the order number and the serial number.

The transducer face must be protected by a rigid, padded cover (e.g. a wooden box lined with foam rubber) all the time it is exposed to the risk of physical damage.

Note

Once the units are unpacked, great care must be taken to ensure that transducers and cabling are not exposed to any mechanical stress.

Re-packing

If the unit is not to be installed immediately, re-pack it in its original packing material to prevent damage in the intervening period.

→ *Refer to the information on page 19.*

1.9 Storage

Pre-installation storage

The equipment should be stored in its original transportation crate until ready for installation. The crate must not be used for any purpose for which it was not intended (eg. work platform etc.).

Once unpacked, the equipment must be kept in a dry, non condensing atmosphere, free from corrosive agents and isolated from sources of vibration.

Note

Do not break the seal to open a circuit board package before the board is to be used. If the board package is returned to the manufacturers with the seal broken, the contents will be assumed to have been used and the customer will be billed accordingly.

The unit must be installed in its intended operating position as soon as possible after unpacking.

If the unit contains normal batteries, these may have been disconnected/isolated before the unit was packed. These must then be reconnected during the installation procedure. Units containing batteries are marked.

Caution

Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.

After use storage

Introduction

If a unit is removed from its operating location and placed into storage, it must be properly cleaned and prepared before packing.

Cleaning cabinets

If the unit may have been exposed to salt atmosphere while it was in use, it must be thoroughly cleaned both internally and externally to prevent corrosion.

- Wipe the cabinet externally using a damp cloth and a little detergent. Do not use excessive amounts of water as the unit may not be water tight. On completion, dry the unit thoroughly.
- All surfaces must be inspected for signs of corrosion, eg. flaking/bubbling paint, stains etc. Damaged or suspect areas must be cleaned, prepared and preserved using the correct preservation mediums for the unit. The mediums to be used will usually be defined in the units' maintenance manual.
- Open the unit, and using a vacuum cleaner, remove all dust etc. from the unit. Great care must be taken to ensure the circuit boards and modules are not damaged in the process.

Mechanical units

If the mechanical unit may have been exposed to a salt atmosphere while it was in use, it must be thoroughly cleaned both internally and externally to prevent corrosion.

- If the construction materials and type of unit permits, wash the unit using a high-pressure hose and copious amounts of fresh water.

  Examples:

  - The lower parts of hull units (outside the hull)
  - Subsea units
- Ensure that all traces of mud and marine growth are removed. Use a wooden or plastic scraper to remove persistent growth, barnacles etc. On completion, dry the unit thoroughly.

Caution

Do not use a high pressure hose in the vicinity of cables or transducers. Do not use sharp or metal tools on a transducer face.

- If the materials or type of unit prevents the use of a high-pressure hose, wipe the unit using a cloth dampened with water containing a little detergent.

  Example:

  - The upper parts of hull units (inside the hull)
  - Hydraulic systems
- Do not use excessive amounts of water as some components on the unit may not be water tight. Wipe off the detergent with a damp cloth, then dry the unit thoroughly.

- All surfaces must be inspected for signs of corrosion, eg. flaking/bubbling paint, stains etc. Damaged or suspect areas must be cleaned, prepared and preserved using the correct preservation mediums. The mediums to be used will normally be defined in the unit's maintenance manual.

Cables

Wipe clean all exposed cables, and check for damage. If a cable shows signs of wear or ageing, contact Simrad for advice.

Internal batteries

If the unit contains batteries, these may discharge slowly during storage. If the unit is to be stored for an extended period, disconnect or remove all internal batteries.

A suitable piece of insulating material can be placed between the battery and the electrical contacts to prevent electrical discharge. The battery can then remain in the unit, reducing the risk of it being misplaced during the storage period.

Caution

Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.

Dehumidifier

Place a suitably sized bag of desiccant material (silica gel or similar) into the unit to keep the electronic components as dry as possible.

Coatings

Spray the unit externally with a corrosion inhibitor (e.g. a light oil) before packing.

Re-packing

The unit should be stored and transported in its original packing material and/or crate. In the event that this material is not available, proceed as follows:

- Small units must be protected from damp by being placed within a plastic bag at least 0.15 mm thick. An appropriate quantity of desiccant material should be placed inside this bag, and the bag sealed. The sealed unit must then be placed in an appropriate carton or crate, and supported in the container by appropriate shock-absorbing insulation (polystyrene foam chips etc.).

- Large units must be placed in a suitable cardboard box or wooden crate. The unit must be protected against physical damage by means of shock-absorbing insulation mats. The box must be clearly marked with its contents, and must be stored in a dry and dust-free area.
- Ensure that the resulting unit is weather proof as required by the current and expected environment.

ESD precautions

Electrostatic Discharge (ESD)

Electro-Static Discharge (ESD) is the transfer of an electrostatic charge between two bodies at different electrostatic potentials, caused either by direct contact or induction by an electrostatic field.

The passing of a charge through an electronic device can cause localised overheating, and it can also “puncture” insulating layers within the structure of the device. This may deposit a conductive residue of the vaporised metal on the device, and thus create a short circuit. This may result in a catastrophic failure, or degraded performance of the device.

ESD Protection during transport and storage

Sensitive electronic equipment must be transported and stored in protective packing bags, boxes and cabinets. The equipment must NOT be transported or stored close to strong electrostatic, electro-magnetic or radioactive fields.

Unpacking and servicing ESD sensitive equipment

If it is necessary to open and touch the electronics inside the boxes/cabinets, then the following precautions MUST be taken:

- The working area must be covered by an approved conductive service mat that has a resistance of between 50kΩ and 2 MΩ, and is connected directly to a reliable earth point via its earthing cord.
- The service personnel involved must wear a wrist-band in direct contact with the skin, connected to the service mat.
- Printed circuit boards and other components should be placed on the conductive service mat during installation, maintenance etc.

Caution ***If, for any reason, it is necessary to move the circuit board or components from the conductive service mat, they must be placed in an approved anti-static transportation container (e.g. static shielding bag) before transportation.***

- During installation and servicing, all electrical equipment (soldering irons, test equipment etc.) must be earthed.

Temperature protection

If the unit must be protected against extremes of temperature, the carton/crate must be lined on all walls, base and lid with 5 cm thick polyurethane or polystyrene foam.

These units will be identified as delicate in the applicable documentation.

The package must then be clearly marked:

Must not be transported or stored in temperatures below -5 degrees Celsius.

Other units can normally be stored in temperatures between -30°C and +70°C, though refer to the system's Technical Specifications document for details.

Transducers must not be stored in temperatures below -20°C.

2 INSTALLATION PLANNING

Note

For installation in a previously installed trunk system, first read the information about sonar room requirements. Then, for an already installed SQ4, SR240 or SP270 trunk system, proceed to the Hull Unit *installation description.*

→ *Sonar room requirements are described on page 25.*

→ *Installation of the hull unit is described on page 34.*

2.1 General

This chapter provides the marine engineers responsible the information necessary to plan and install the sonar's Hull Unit according to Simrad's requirements.

Correct installation of the sonar transducer is vital to the system's performance. Several variables must be taken into consideration, the most important of which is the vessel's construction. This guide is for use in selecting the best location for the transducer and includes a brief description of areas to be avoided.

Note

Note that installation drawings must be supplied by the shipyard. The installation must be approved by the vessel's national registry and corresponding maritime authority and/or classification society. The shipowner and shipyard performing the installation are responsible for obtaining and paying for installation approval.

Simrad offers free advice for installation planning. Proposed arrangements may be sent for commentary or suggestions supplied by Simrad. The following drawings should be submitted should assistance be requested:

- General arrangement
- Body plan and drawings of relevant bottom tanks and coffer-dams
- Lines plan

2.2 Location of the Hull Unit

Fore and aft

The Hull Unit should preferably be located within 1/10 to 1/3 the vessel's Length Between Perpendiculars (LBP) measured from its Forward Perpendicular (FP). Deviations from this rule should not be made without consulting Simrad.

→ *The location of the hull unit is indicated in figure 2.*

Athwartships

The Hull Unit may be located on the Centre Line (CL) of the vessel, or alongside its keel. If the installation is off-set from the vessel's centre line, make sure that transducer transmission and reception will not be obstructed by the keel.

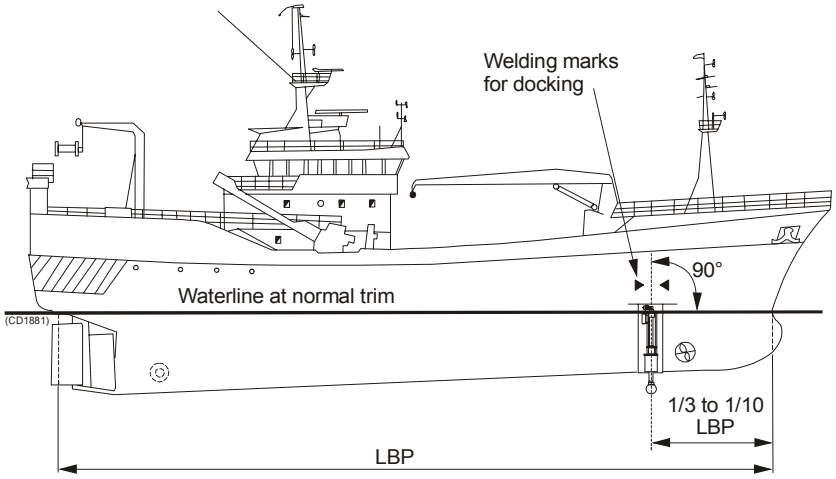


Figure 2 Location of the Hull Unit

Important considerations

The Hull Unit trunk must be installed so that it will be vertical under normal operating conditions.

The primary sources of underwater disturbance (other than a vessel's main propeller and bow/sternthruster) that affect transducer reception are:

- Main or bilge keels
- Zinc anodes
- Cooling elements protruding from the hull
- Equipment such as sonar transducers and pitot tubes
- Sea chests

- Overboard discharges
- Dents in the hull

All appendages to the hull, indentations and pipe in/outlets are potential sources of underwater noise. They may act as resonant cavities amplifying noise at certain frequencies, create cavitation or turbulence. Transducers should not be located in the vicinity of such objects and especially not immediately aft of them.

2.3 Sonar room requirements

Size

The sonar room must be dimensioned to house both the Hull and the Transceiver Unit. This is due to the limited length of the flexible hose protected cabling (approximately 3.5 m) connecting the two.

A well designed sonar room reduces the risk of corrosion and simplifies maintenance increasing system reliability. The sonar room should not be unnecessarily obstructed by girders, pipes etc. which might cause installation problems or impede maintenance.

→ *Refer to figure 3 on page 27 for an example of a sonar room arrangement.*

Access hatches

The sonar room must be accessible under all conditions at sea or at a berth. All doors or hatches should be designed so that the equipment can be removed without being disassembled.

Lifting

An attachment point, rated at a minimum of two tons, for supporting a lifting device should be located above the Hull Unit. This permanently installed fixture will facilitate Trunk and Hull Unit mounting and also may be used for service of the equipment in the future.

Heating

The sonar room should be equipped with heater, dimensioned to maintain the equipment within its environmental tolerances (at least 1000 W), installed close to the deck. Heating is also an effective method for reducing humidity.

→ *Refer to page 152 for more information concerning environmental tolerances.*

Insulation

Bulkheads must be insulated and provided with an interior wall to the deck. The insulation should be the minimum equivalent of 50 mm of rock-wool. In addition, piping passing through the space prone to condensation must be insulated.

Ventilation

The sonar room should be connected to the vessel's ventilation system. If this is not possible, two 3-inch vents must be provided from the sonar room to the main deck.

In the sonar room, the air inlet should be located in close to the deck and the outlet as high as possible. A funnel shaped drip-collector should be mounted below the vent pipes to divert moisture to the bilge.

On the main deck, the best ventilation is provided when the outlet pipe is at least four meters higher than the inlet pipe. To keep out sea water, rain and spray, the ventilation pipes should be fitted with goosenecks of the equivalent.

Conduit

If the cable between the wheelhouse and the sonar room passes through hatches or areas where it may be damaged, it should be run through a conduit (two inch conduit is recommended).

Air vent pipe

An air vent conduit with a minimum of 10 mm internal diameter must be attached to the air bleeding cock on the Hull Unit. The pipe should be laid with with continuous rise to free air on deck or through the ship's side.

Note

Through-hull modifications are subject to approval by the vessel's national registry and corresponding maritime authority. The shipowner and shipyard are responsible for obtaining installation approval.

Bilge pump

The sonar room should be connected to the vessel's bilge pump system. If this is not possible, a separate bilge pump for the sonar room must be installed.

Lighting

The sonar room should be equipped with suitable lighting to simplify the installation and aid future maintenance.

Dry docking

Make sure that ample space is provided between the vessel and dry dock for system installation. To facilitate future dry docking, mark the position of the installed trunk as indicated.

→ *Refer to figure 2 on page 23.*

Decking

Once the installation has been completed, the sonar room should be suitably decked without restricting access to the equipment.

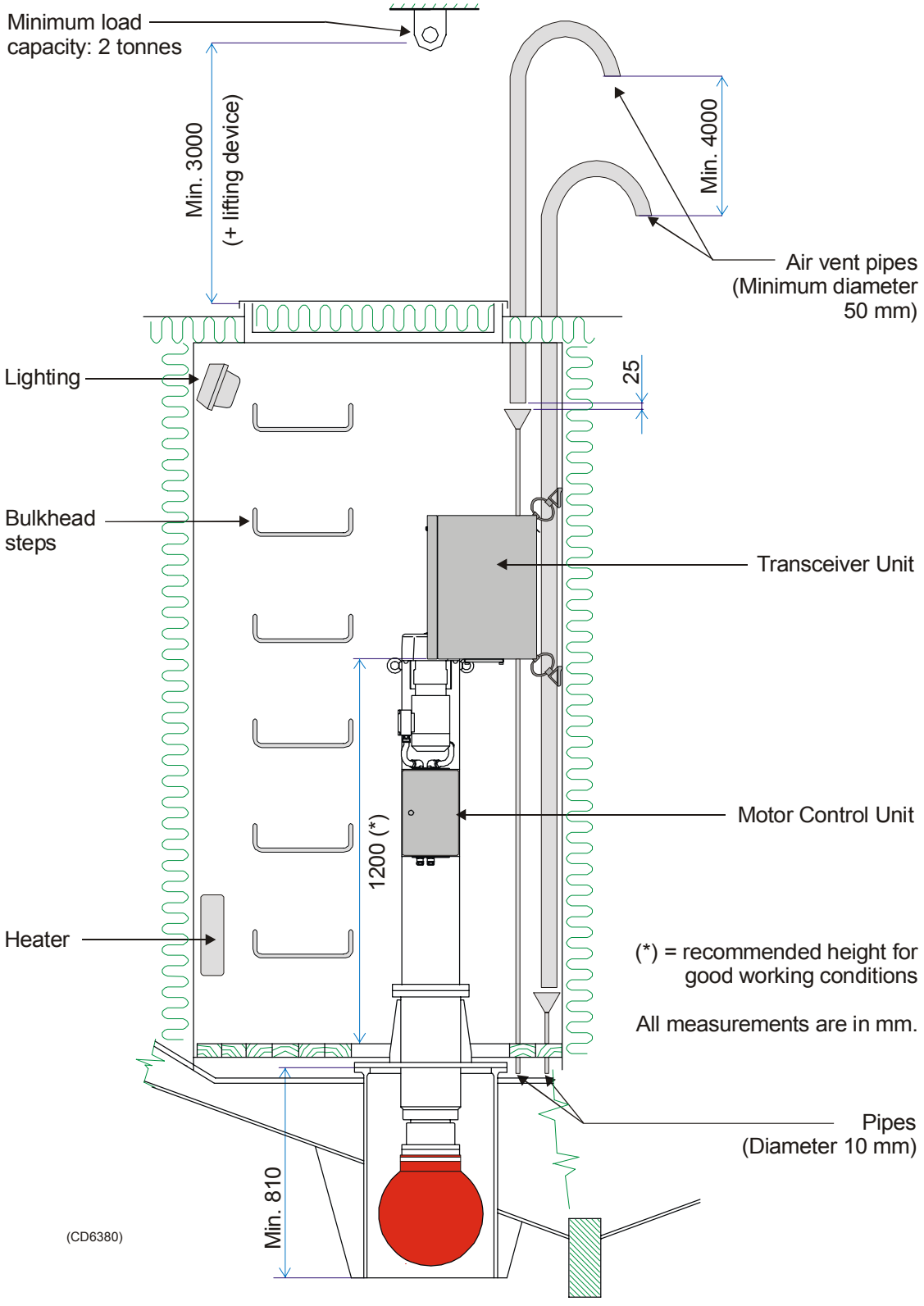


Figure 3 Sonar room example

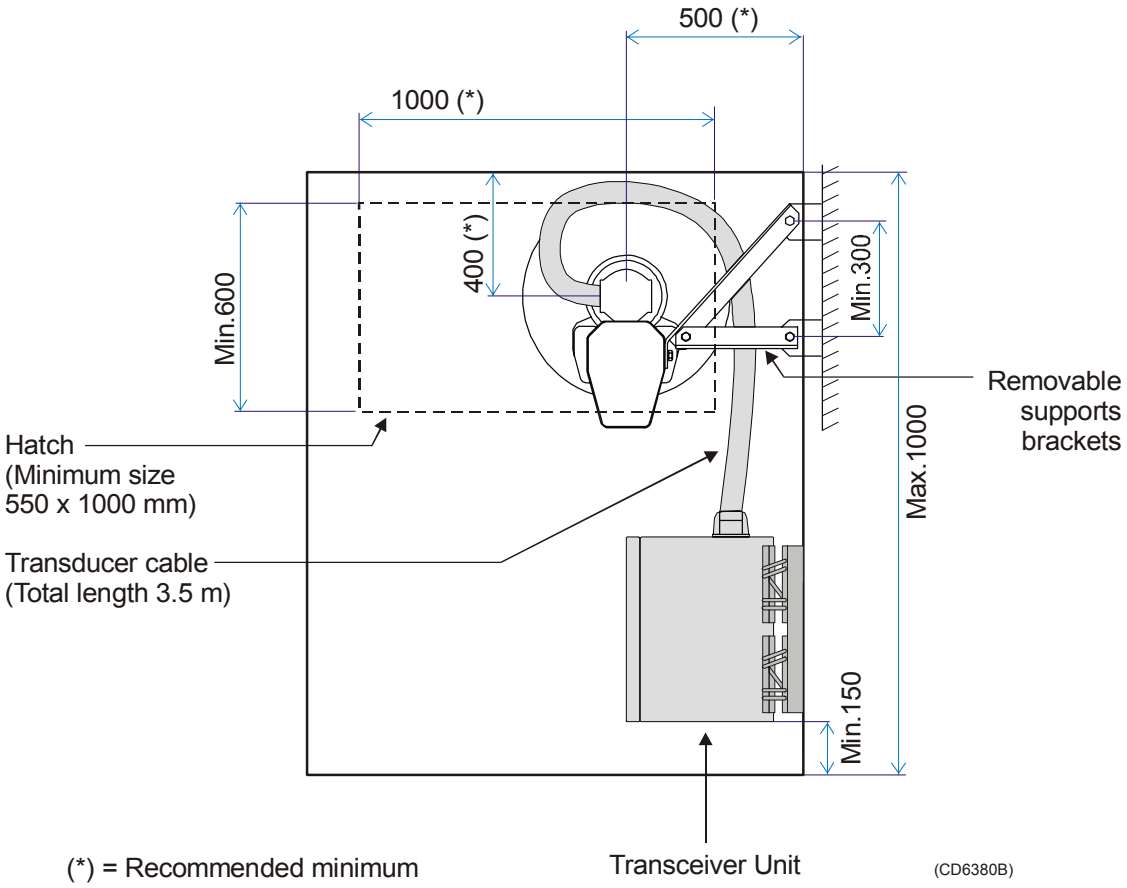


Figure 4 Sonar room example - top view

3 SONAR TRUNK

3.1 Mounting of the trunk

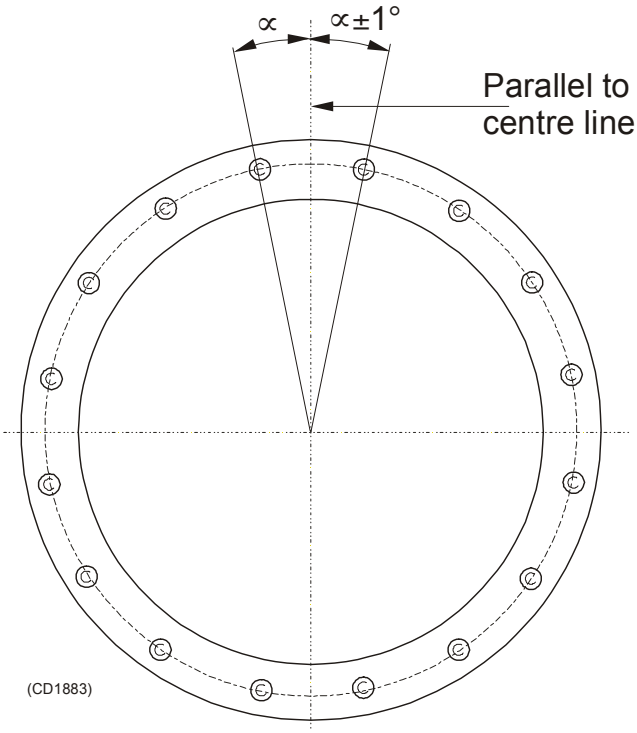
The location of the sonar trunk must be carefully selected.

→ *Refer to the* Installation planning *information on page 22.*

Note

Note the orientation of the centre line of the trunk with regard to the mounting bolts. Remove the gasket on the top flange during welding.

Figure 5 Orientation of the sonar trunk



The height from the top of the trunk flange, to the underside of the protection blister, must be as shown in the referenced figures.

→ *Refer to figures 6 and 7 on pages 32 and 33.*

The top flange must be parallel to the construction water-line in both the fore-and-aft and athwartships directions.

The installation trunk must be welded to a doubling plate which should be at least 1.5 times as thick as the surrounding shell plating. The doubling plate's final dimensions are to be governed by the approved installation drawings supplied by the shipyard. The trunk must also be stiffened by welding knee-plates to it and the doubling plate in both the fore-and-aft and athwartships directions.

3.2 Protection

Protecting blister

A steel blister must be fitted for protection. The blister shown is welded to the shell plating and then filled with oil to prevent corrosion. This method provides excellent protection and simplifies maintenance.

→ *Refer to figure 6 on page 32.*

Open blister types are designed to be welded to the shell plating.

→ *Refer to figure 7 on page 33.*

Corrosion protection

As soon as all installation, welding and grinding has been performed, the trunk and the surrounding area should be primed and painted using a quality protective coating.

3.3 Trunk installation measurements

For future reference, measurements A, B, C and D from the drawings must be made and noted in the *Trunk installation measurements* table provided.

	Millimetres	Inches
Distance A		
Height B		
Height C		
Height D		

Table 1 Trunk installation measurements

If an other type of installation is chosen, make a sketch including all relevant dimensions.

3.4 Principles

The drawings on the next pages illustrate the installation of the sonar trunk.

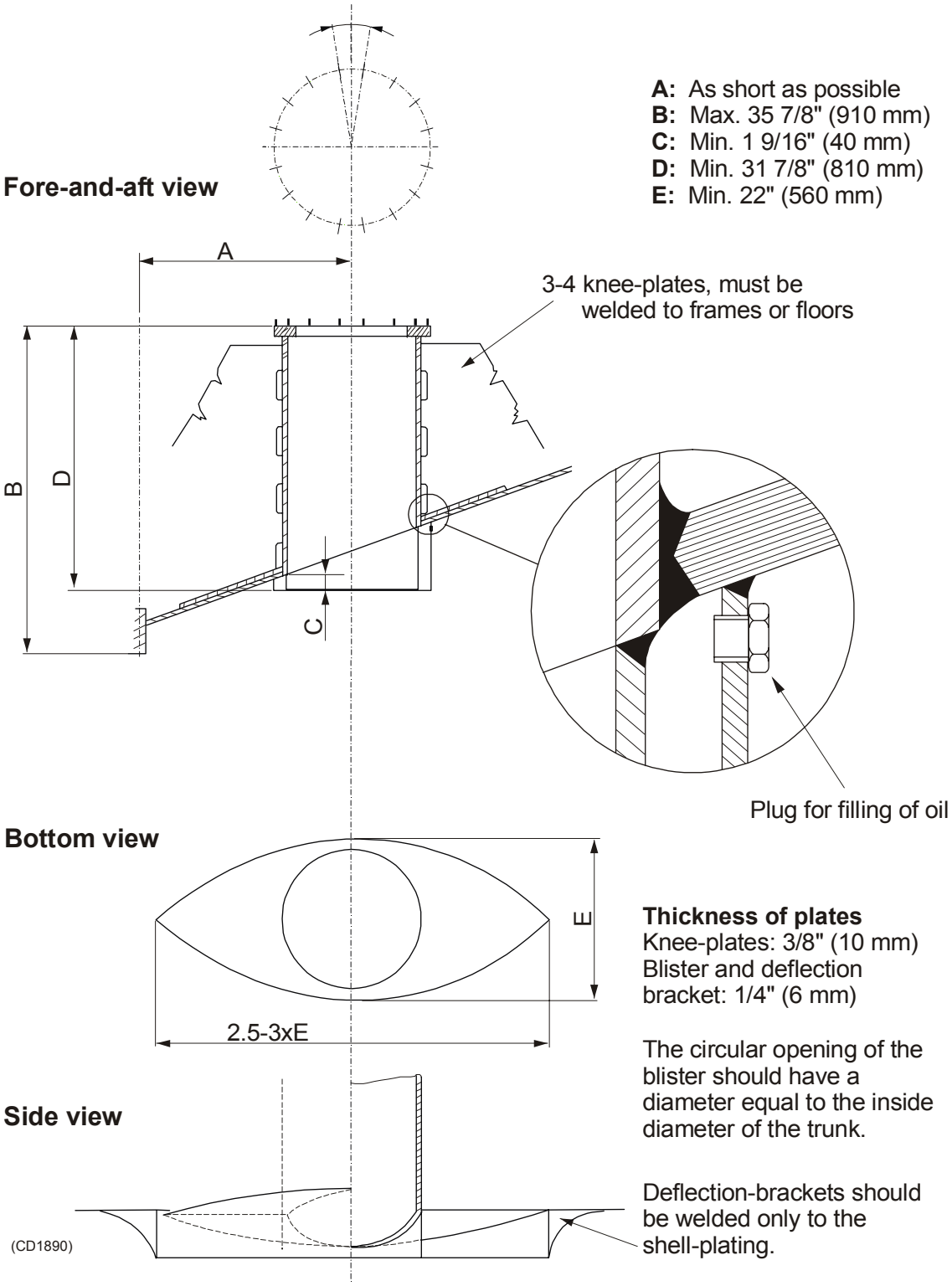

A: As short as possible
B: Max. 35 7/8" (910 mm)
C: Min. 1 9/16" (40 mm)
D: Min. 31 7/8" (810 mm)
E: Min. 22" (560 mm)
Fore-and-aft view
A
3-4 knee-plates, must be welded to frames or floors
B
D
C
Plug for filling of oil
Bottom view
E
2.5-3xE
Thickness of plates
Knee-plates: 3/8" (10 mm)
Blister and deflection bracket: 1/4" (6 mm)
The circular opening of the blister should have a diameter equal to the inside diameter of the trunk.
Side view
Deflection-brackets should be welded only to the shell-plating.
(CD1890)

Figure 6 Trunk installation with extension and oil-filled blister.

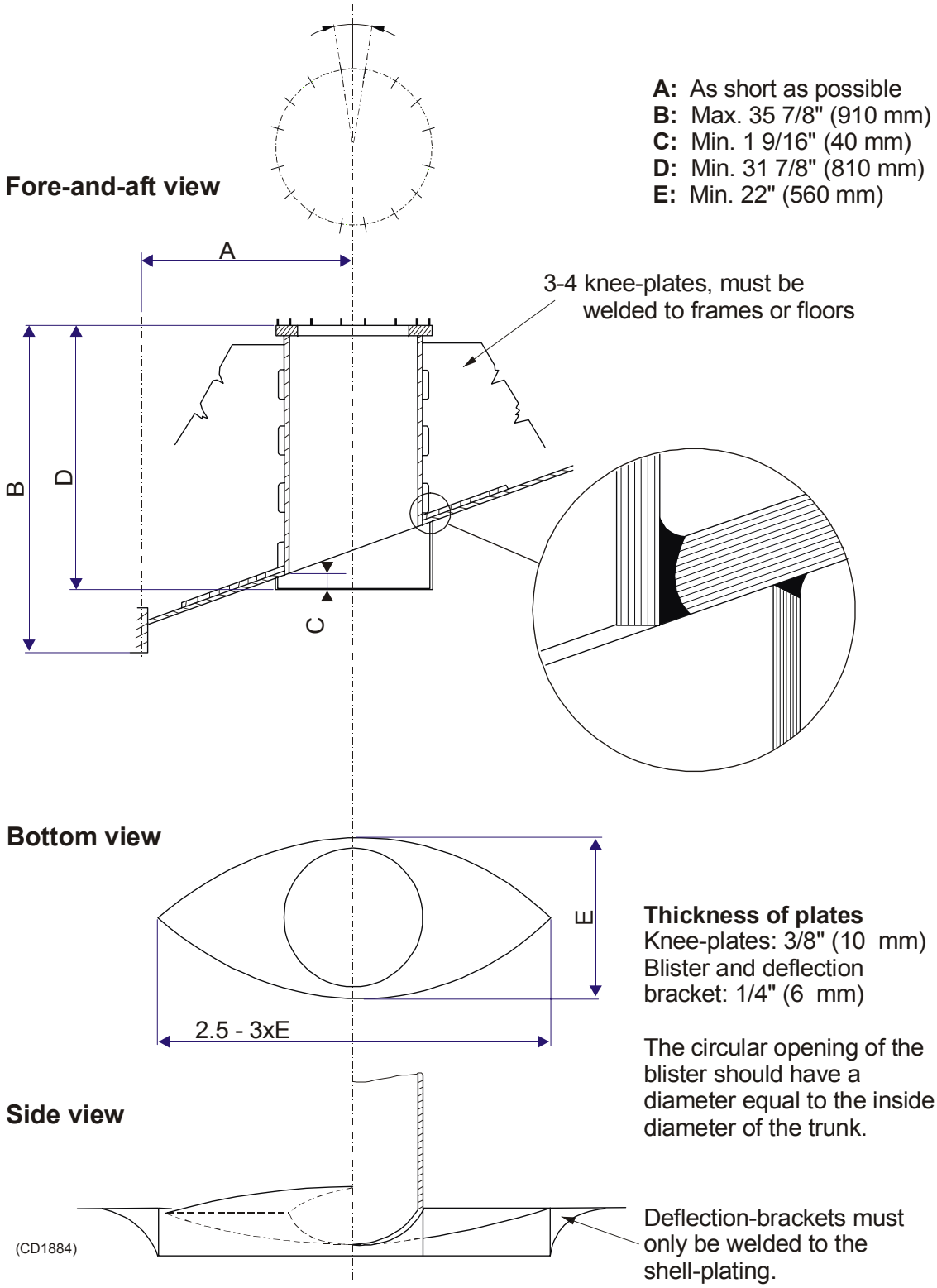

A: As short as possible
B: Max. 35 7/8" (910 mm)
C: Min. 1 9/16" (40 mm)
D: Min. 31 7/8" (810 mm)
E: Min. 22" (560 mm)
Fore-and-aft view
A
3-4 knee-plates, must be welded to frames or floors
B
D
C
Bottom view
E
2.5 - 3xE
Thickness of plates
Knee-plates: 3/8" (10 mm)
Blister and deflection bracket: 1/4" (6 mm)
The circular opening of the blister should have a diameter equal to the inside diameter of the trunk.
Side view
Deflection-brackets must only be welded to the shell-plating.
(CD1884)

Figure 7 Trunk installation with open protection blister.

4 HULL UNIT

4.1 Introduction

The hull unit is a crucial part of the sonar system. Due to its physical size and weight, and the fact that the trunk penetrates the vessel hull, it is very important that the hull unit is installed and secured properly.

This chapter describes the physical installation of the hull unit. The following information is provided.

→ *Overview of hull unit models, page 35.*

→ *Unpacking, page 36.*

→ *Mounting, page 37.*

→ *Bleeding air, page 38*

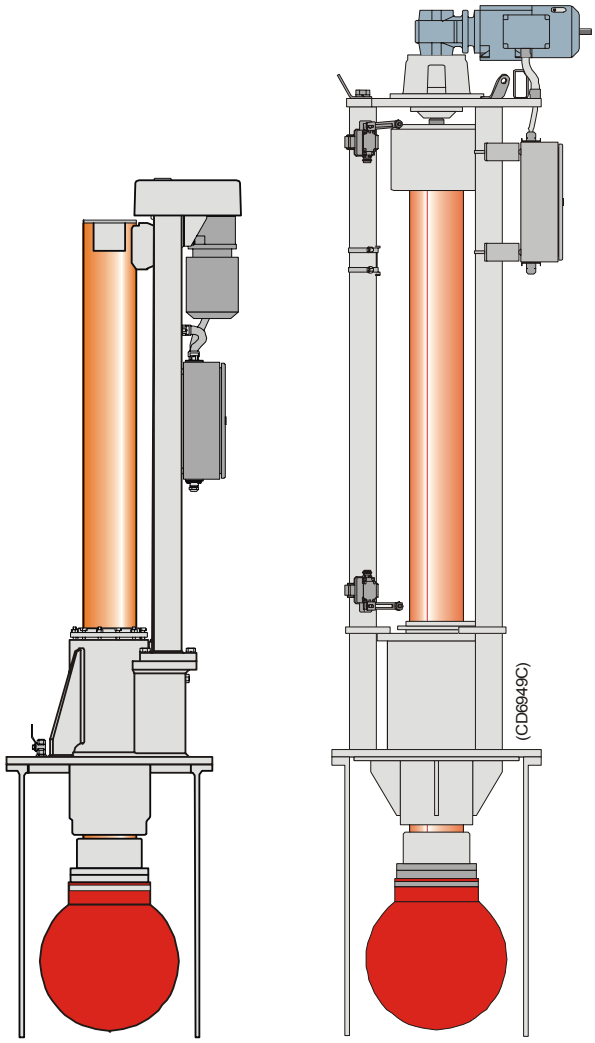
→ *Mechanical support, page 39.*

→ *Transducer alignment, page 34.*

→ *Installation check-list, page 41.*

4.2 Hull unit models

The SP60 sonar may be delivered with one of two different hull unit models.



- **SP60** - This is the “standard hull” unit for the SP60 sonar. It has 1.0 m stroke length, and it is designed for maximum speed 15 knots. It will fit on a standard Simrad trunk with 540 mm pitch centre diameter (PCD).
- **SP61** - This hull unit has 1.2 m stroke length, and it is designed for maximum speed 15 knots. It will fit on a standard Simrad trunk with 540 mm pitch centre diameter (PCD).

Note that both the SP60 and the SP61 hull units use the exact same trunk installation.

4.3 Unpacking

WARNING **Do not remove the transducer protection from the transducer until just before the Hull Unit is to be lowered into the trunk.**

The transducer is specially protected to prevent damage during transport and installation of the Hull Unit, and should remain attached while it is being manoeuvred into the sonar room.

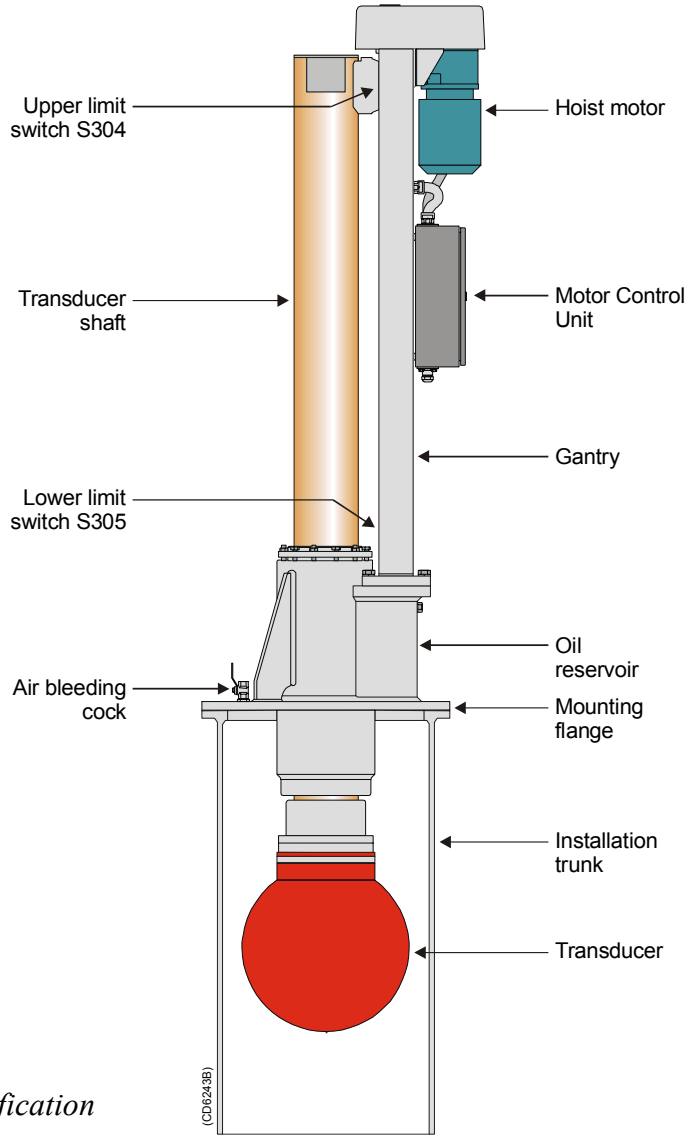


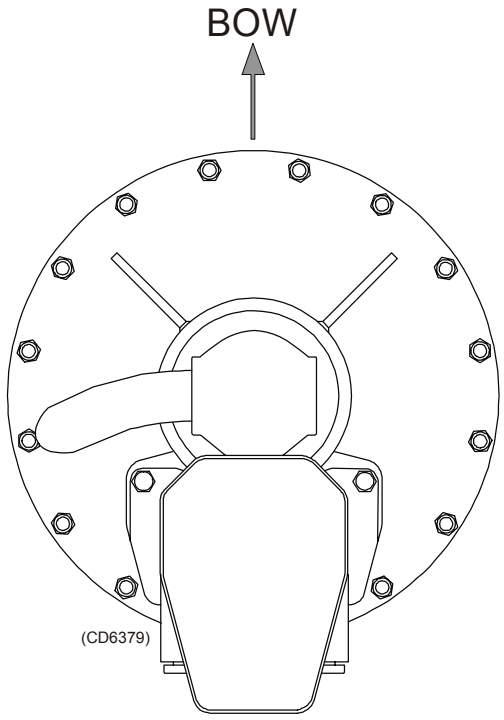
Figure 8 Hull Unit parts identification

When unpacking the Hull Unit, first remove the top cover of the wooden box, then pull out the nails marked with Indian ink. Fasten the lifting device to the two lifting eye bolts on top of the gantry and lift the Hull Unit (with transducer protection in place) carefully out of the transportation box.

4.4 Mounting

The Hull Unit should normally be oriented with the hoisting/lowering motor pointing aft.

Figure 9 Recommended orientation of the Hull Unit



If this orientation makes the motor control unit attached to the Hull Unit difficult to access, the Hull Unit may be oriented in the most suitable position.

Note

The Motor Control Unit must never be disconnected from the Hull Unit.

Observe the following procedure. To ensure correct operation, tick off every item when the action has been carried out.

- ☐ **1** Use a tackle to lower the Hull Unit (with the transducer protection in place) into the sonar room.
- ☐ **2** Remove the blind cover from the trunk and check that the gasket is not damaged.
- ☐ **3** Store the blind cover in the sonar room for possible future use.
- ☐ **4** Remove the transducer protection and lower the Hull Unit carefully onto the trunk.
- ☐ **5** Tighten the flange nuts with a torque of approximately 6 kpm.
- ☐ **6** Keep the transducer cable and connector dry, and handle them with great care to prevent mechanical damage.

4.5 Bleeding air

To avoid damage to the transducer by the transmission in air inside the trunk, a pipe with a minimum inside diameter of 10 mm must be attached to the air bleeding cock. This vent should be run with continuous rise to the main deck or through the vessel's side. Make sure the air bleeding cock is opened.

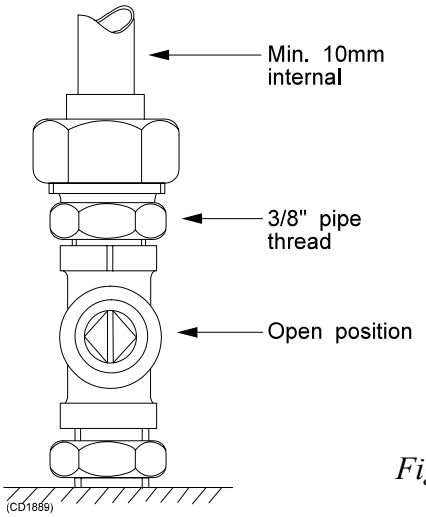


Figure 10 Air bleeding cock

4.6 Mechanical support

To ensure the safety of the sonar system and the vessel, it is very important that the mechanical support of the hull unit gantry is satisfactory.

To prevent unwanted vortex induced vibration, the Hull Unit must be secured to the bulkhead. Use the two pre-drilled holes on the gantry to mount support brackets in the fore-and-aft and sideways direction. It must be possible to remove the support brackets if maintenance is required.

4.7 Transducer alignment

Note that the transducer should not be mechanically aligned even though the Hull Unit is oriented differently than shown.

Transducer alignment will be later performed in the Processor Unit by rotating the echo presentation in the Processor Unit.

4.8 Installation check-list

Refer to section *Sonar room requirements* when you fill in the following check list.

INSTALLATION CHECK-LIST	YES	NO
Are the access hatches satisfactory?		
Is the heating satisfactory?		
Is the insulation satisfactory?		
Is the ventilation satisfactory?		
Is a bilge pump installed?		
Is the lighting satisfactory?		
Is the sonar room suitably decked?		
Is the mechanical support of the hull unit satisfactory?		

Table 2 Hull unit installation check list

If the answer to any of these questions is **NO**, note the deficiencies in the *Installation remarks and signature*.

→ Installation remarks and signatures *are found on page 196.*

5 TRANSCEIVER UNIT

Introduction

Note

The Transceiver Unit must be mounted as a complete unit, i.e. the door should not be opened until the unit is securely fastened to the bulkhead.

Before mounting the Transceiver Unit, observe that the distance between the Hull Unit and the Transceiver Unit is restricted by the flexible transducer cable joining the two. Remember to take into consideration the slack necessary to lower the transducer.

Caution

Do not fasten the transducer cable to the Transceiver Unit until described later in the start-up procedure.

Free bulkhead space is required to mount the Transceiver Unit cabinet.

→ *Drawing references, see pages 45, 43 and 44.*

Procedure

Observe the following procedure. To ensure correct operation, tick off every item when the action has been carried out.

☐ **1** Remove the two mounting brackets which are fastened to the shock absorbers on the Transceiver Unit.

- Use the Allen key found in the plastic bag fastened to the upper shock absorber.

☐ **2** Weld the mounting brackets securely to the bulkhead.

☐ **3** Use a chain fall or similar device to lift the Transceiver Unit into position and bolt it to the mounting brackets.

- Note that eight bolts are provided in the plastic bag fastened to the upper shock absorber.

☐ **4** Connect the grounding cable from the Transceiver Unit to the mounting bracket.

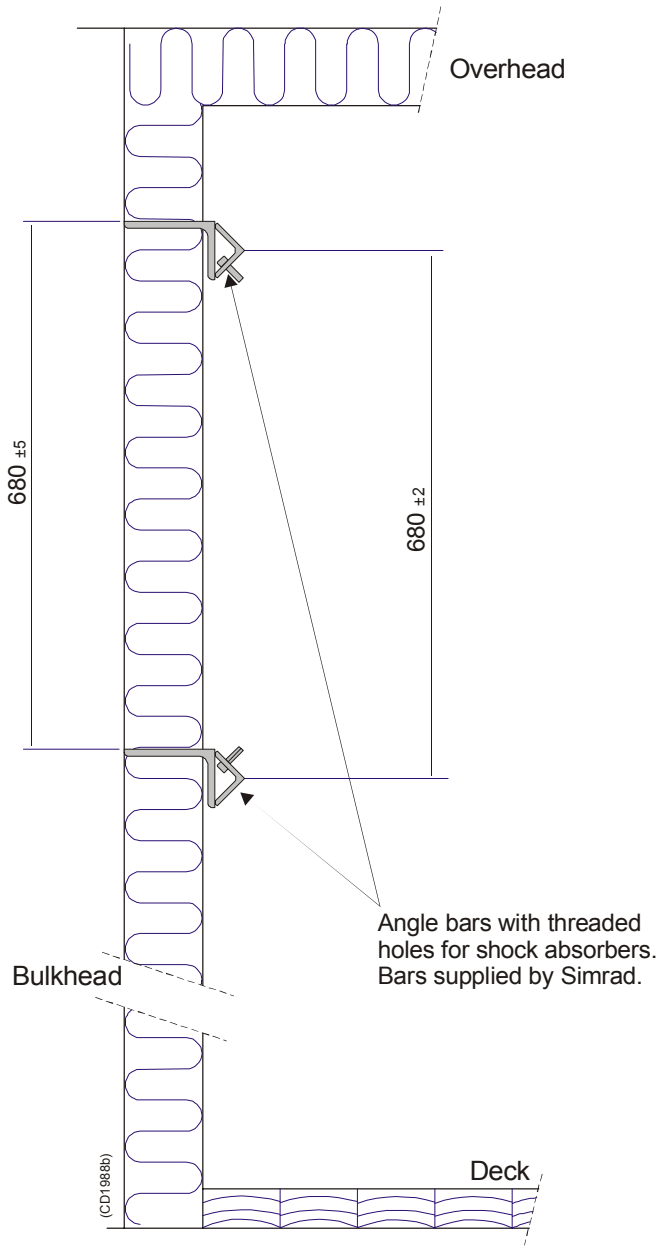


Figure 11 Mounting the brackets for the Transceiver Unit - side view

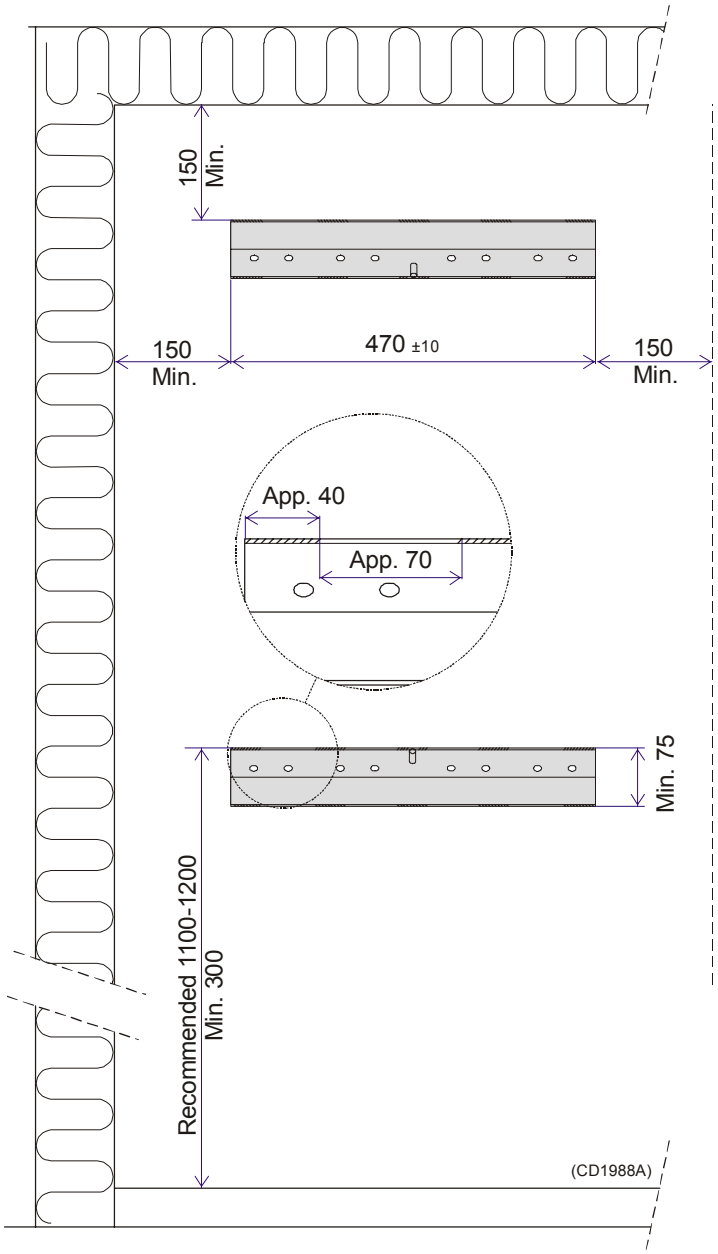


Figure 12 Mounting the brackets for the Transceiver Unit - forward view

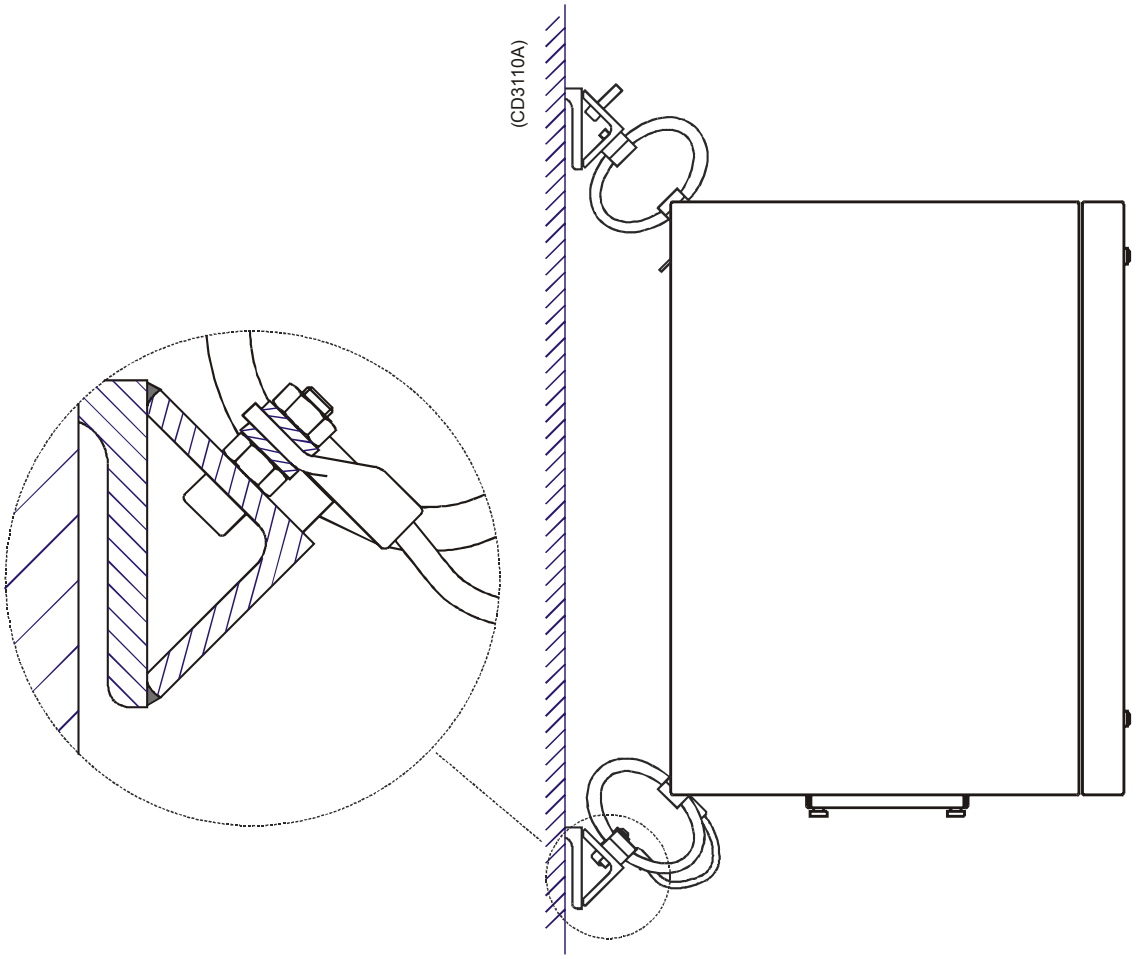


Figure 13 Mounting the Transceiver Unit

6 WHEELHOUSE UNITS

6.1 Overview

This chapter explains how to install the SP60 hardware units normally positioned in the wheelhouse.

Topics

→ *Location, page 47.*
→ *Colour display, page 50.*
→ *Operating Panel (optional), page 51.*
→ *Sonar Processor Unit, page 52.*
→ *Sonar Interface Unit, page 53.*
→ *Loudspeaker, page 54.*

6.2 Location

Introduction

On board routines should be thoroughly discussed with the captain when selecting the locations for the Operating Panel and display.

Distances

Observe the maximum distances between the wheelhouse units.

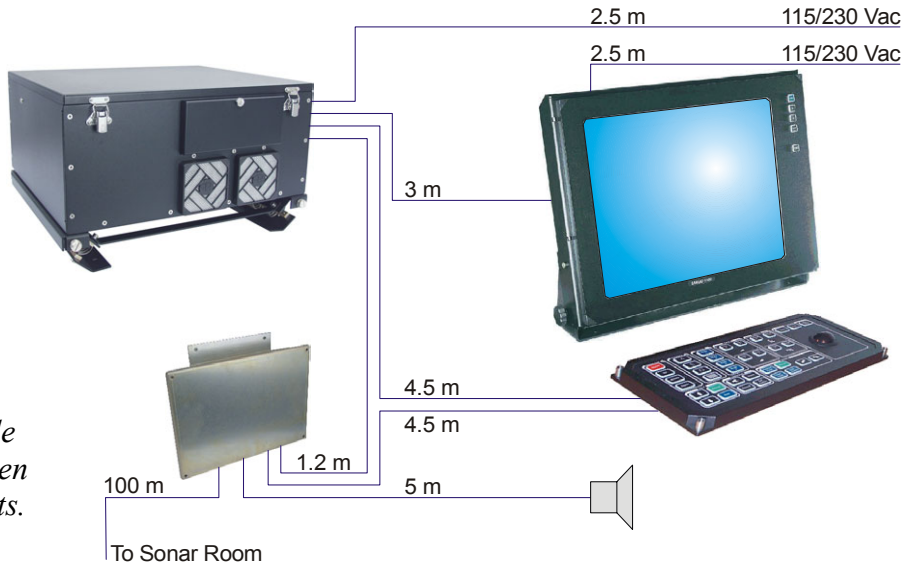


Figure 14 Maximum cable distances between wheelhouse units.

Installation requirements

Installation of the wheelhouse units must be performed by qualified and trained personnel with regard to:

- The safe navigation of the vessel.
- The “Compass safe distance” for each individual unit.
- Ergonomically correct operating and viewing heights.
- Maximum allowable cable distances between the various units.
- The installation areas are dry, well ventilated and free of excessive dust and vibration.
- Easy access to the cable connections on the back of the equipment is provided.
- Enough extra cable is allowed to facilitate maintenance and service by not having to disconnect the cables.

Display unit

The display unit should be located so that it is best protected from glare which reduces readability. It may be:

- Panel mounted
- Desktop mounted
- Bulkhead mounted
- Overhead mounted

Refer to the display unit's instruction manual for the compass safe distance.

Sonar Operating Panel

An ergonomiclly correct Operating Panel helps to reduce operator fatigue. It should be mounted in a nearly horizontal position to facilitate trackball operation, and within easy viewing range of the display unit.

The compass safe distance must be allowed for when planning the unit's location:

- Standard compass 0.05 m.
- Steering compass 0.05 m.

Sonar Processor Unit

The Sonar Processor Unit (MC70) should be installed inside a console, in a cabinet or on a desk. Make sure that adequate ventilation is available to avoid overheating.

The compass safe distance must be allowed for when planning the unit's location:

- Standard compass 0.15 m.
- Steering Compass 0.1 m.

Sonar Interface Unit

The Sonar Interface Unit should be mounted vertically with the cable inlet downwords on a side wall inside a console, cabinet or desk. Provide enough space for easy access for cable connections to the unit.

The compass safe distance must be allowed for when planning the Sonar Interface Unit's location:

- Standard compass TBD m.
- Steering Compass TBD m.

Loudspeaker

Choosing a location and installation of the loudspeaker should be done with regard to utility.

The compass safe distance must be allowed for when planning the unit's location:

- Standard compass: TBD m.
- Steering Compass: TBD m.

6.3 Display unit

Different display units are available as optional equipment. For installation and operation of the chosen display unit, refer to the manual supplied with the unit.

→ *Refer to page 5 for more information about the displays available from Simrad.*

☐ **1** Mount the display as described in its respective manual.

Related topics

→ *Maximum cable distances, page 47.*

6.4 Sonar Operating Panel

Observe the following procedure. To ensure correct operation, tick off every item when the action has been carried out.

☐ **1** Mount the Sonar Operating Panel in an almost horizontal position to facilitate operation of the trackball.

- The necessary mounting hardware (four screws, four nut plates and four bolt covers) are supplied in the standard delivery.

☐ **2** Drill and cut the panel opening as shown in the figure.

☐ **3** Mount the Sonar Operating Panel using the supplied hardware.

a Position the four nut plates shown in the figure.

b Use a 3 mm Allen key to fasten the four special bolts.

c Mount the bolt covers in the four corners of the Operating Panel.

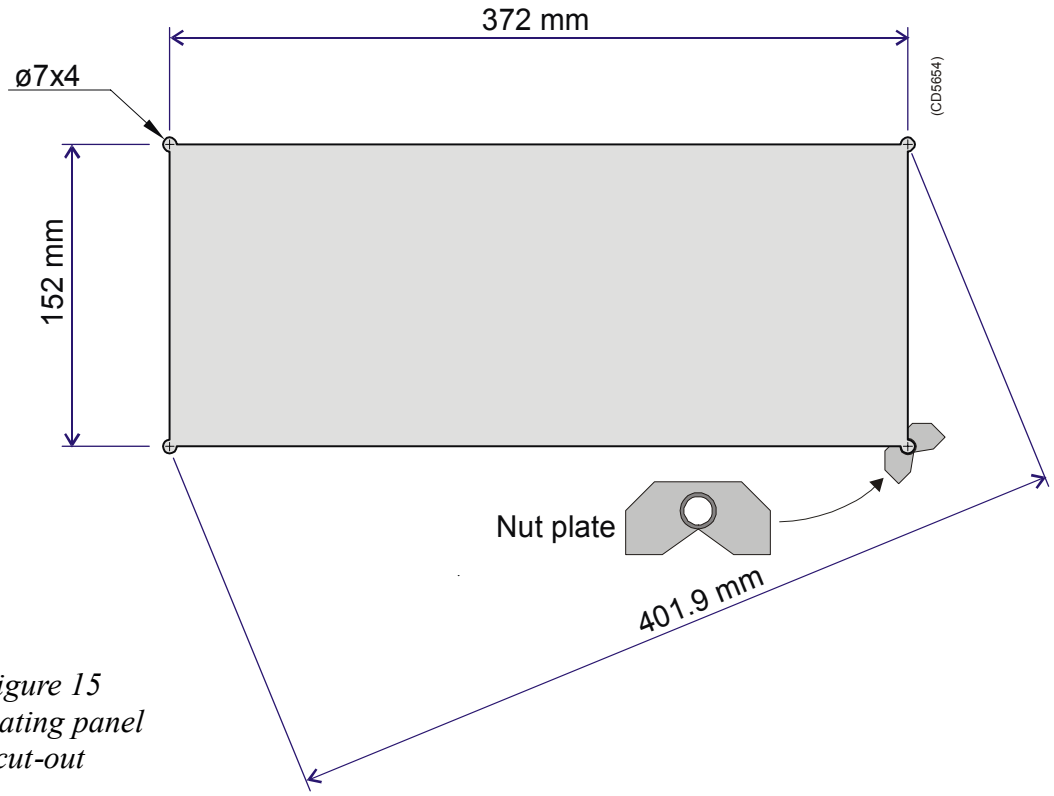


Figure 15 Operating panel cut-out

Related topics

→ *Maximum cable distances, page 47.*

6.5 Sonar Processor Unit (MC70)

The MC70 Sonar Processor Unit should be mounted on the deck or shelf inside a console, cabinet or desk. It must be mounted close to the Sonar Interface Unit, Operating Panel and display unit.

Provide enough space for easy access to the cabling at the rear of the unit and for removal of the front lid.

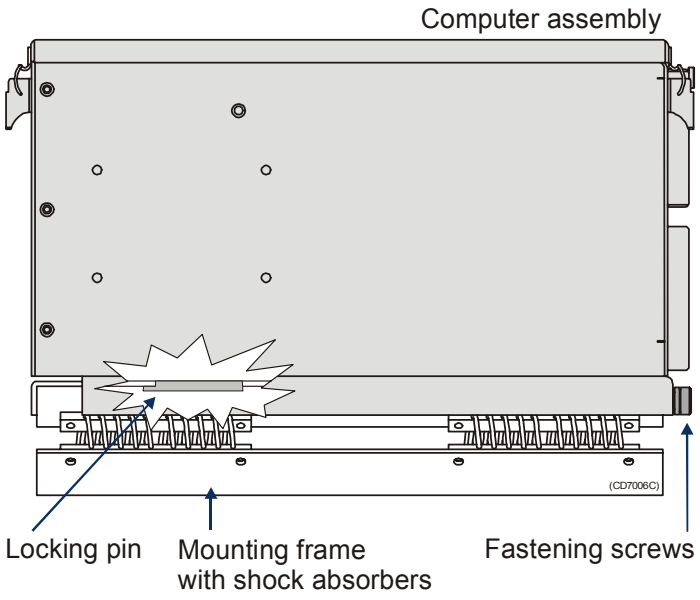


Figure 16 Mounting the Sonar Processor Unit.

Observe the following procedure. To ensure correct operation, tick off every item when the action has been carried out.

- ☐ **1** Prepare the mounting location.
- ☐ **2** Dismount the mounting frame with the shock absorbers from the Sonar Processor Unit by loosening the two fastening screws on the front, and pull the computer assembly forwards.
- ☐ **3** Place and secure the mounting frame with six bolts or screws to the basement. The diameter of the holes are 7 mm.
- ☐ **4** Reattach the Sonar Processor Unit to the mounting frame by guiding it backwards until the locking pins at the bottom of the computer assembly find the correct positions. Secure the assembly with the two fastening screws on the front.

Related topics

→ *Maximum cable distances, page 47.*

6.6 Sonar Interface Unit

The Sonar Interface Unit should be mounted vertically with the cable inlet downwords on a side wall inside a console, cabinet or desk. It must be mounted close to the Sonar Processor Unit, Operating Panel and display unit.

Provide enough space for easy access to the cabling.

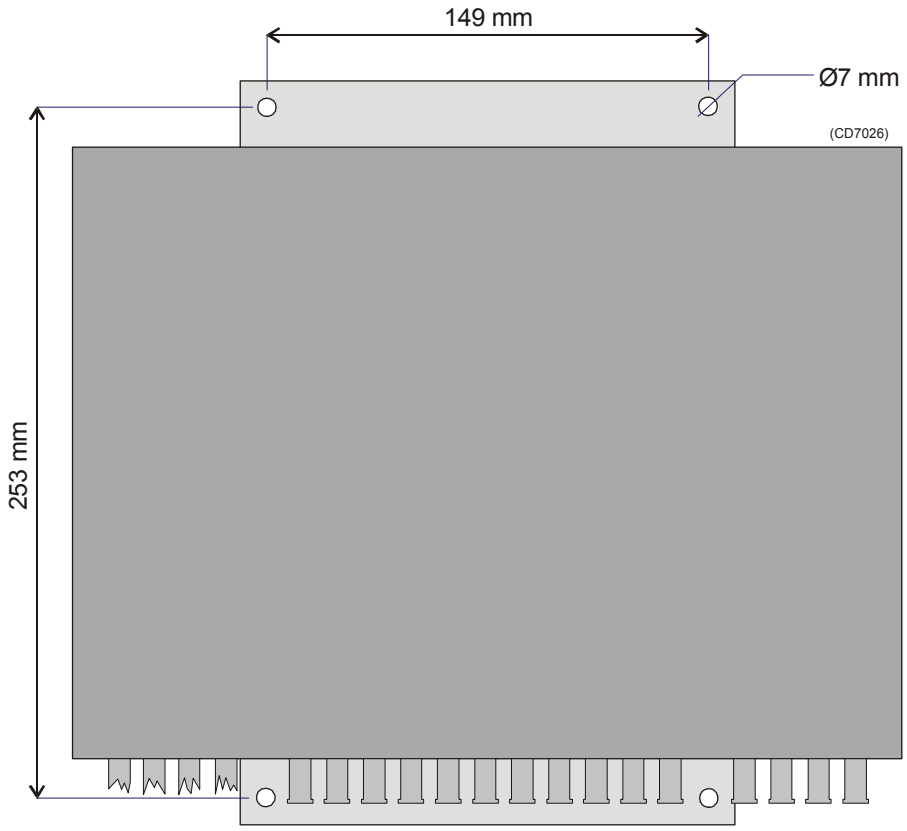


Figure 17 Mounting the Sonar Interface Unit.

Observe the following procedure. To ensure correct operation, tick off every item when the action has been carried out.

- ☐ **1** Prepare the mounting location.
- ☐ **2** Attach the Sonar Interface Unit vertically with four fastening screws on the attachment lugs. The diameter of the four fastening holes are 7 mm.

Related topics

→ *Maximum cable distances, page 47.*

6.7 Loudspeaker

The loudspeaker should be mounted on the deckhead or anywhere practical close to the display unit.

Provide enough space for easy access to the cabling.

Observe the following procedure. To ensure correct operation, tick off every item when the action has been carried out.

- ☐ **1** Prepare the mounting location.
- ☐ **2** Place and secure the unit as described in the loudspeaker's mounting description.

Related topics

→ *Maximum cable distances, page 47.*

7 CABLE LAYOUT

7.1 Introduction

This chapter describes the installation requirements for SP60 system wiring. These instructions must be used together with the applicable cable plan.

Note

All electronic installations and corresponding wiring must be in accordance with the vessel's national registry and corresponding maritime authority and /or classification society.

If no such guide-lines exist, Simrad AS recommends that Det Norske Veritas (DNV) Report No. 80-P008 «Guidelines for Installation and Proposal for Test of Equipment» be used as a guide.

The following information is provided:

→ *System cabling, page 56.*

→ *Cable plan, page 57.*

→ *Cable specifications, page 58.*

→ *Wheelhouse cabling, page 60.*

→ *Sonar room cabling, page 66.*

More information concerning cabling is found in these chapters:

→ *General cable requirements, page 72.*

→ *Peripheral equipment, page 75.*

7.2 System cabling

Cable layout

Cables are identified according to individual cable numbers and drawing numbers listed on the cable plan and in the cable overview table.

→ *The cable plan is shown on page 57.*

→ *The cable specifications are provided on page 58.*

Cable information includes:

- Required specifications
- Equipment they are connected to
- Corresponding terminations

System and shipyard cables

Cables fall into two categories:

- Cables supplied by Simrad with the standard SP60 system delivery. These cables are marked on the cable plan with an asterisk (*).
- Cables provided by the shipyard performing the installation or the shipowner.

System cables

Most system cables in the standard delivery are supplied by Simrad. Cables to be provided by the installation shipyard are specified in the cable specifications.

Shipyard cables

The cable specifications provided are the *minimum acceptable*. Detailed cable information is provided for the:

- Connections at each end (including reference to the corresponding: system unit, terminal board identification and plug/socket to be used).
- Number of cores
- Recommended type
- Minimum specifications

Simrad accepts no responsibility for damage to the system or reduced operational performance caused by improper wiring.

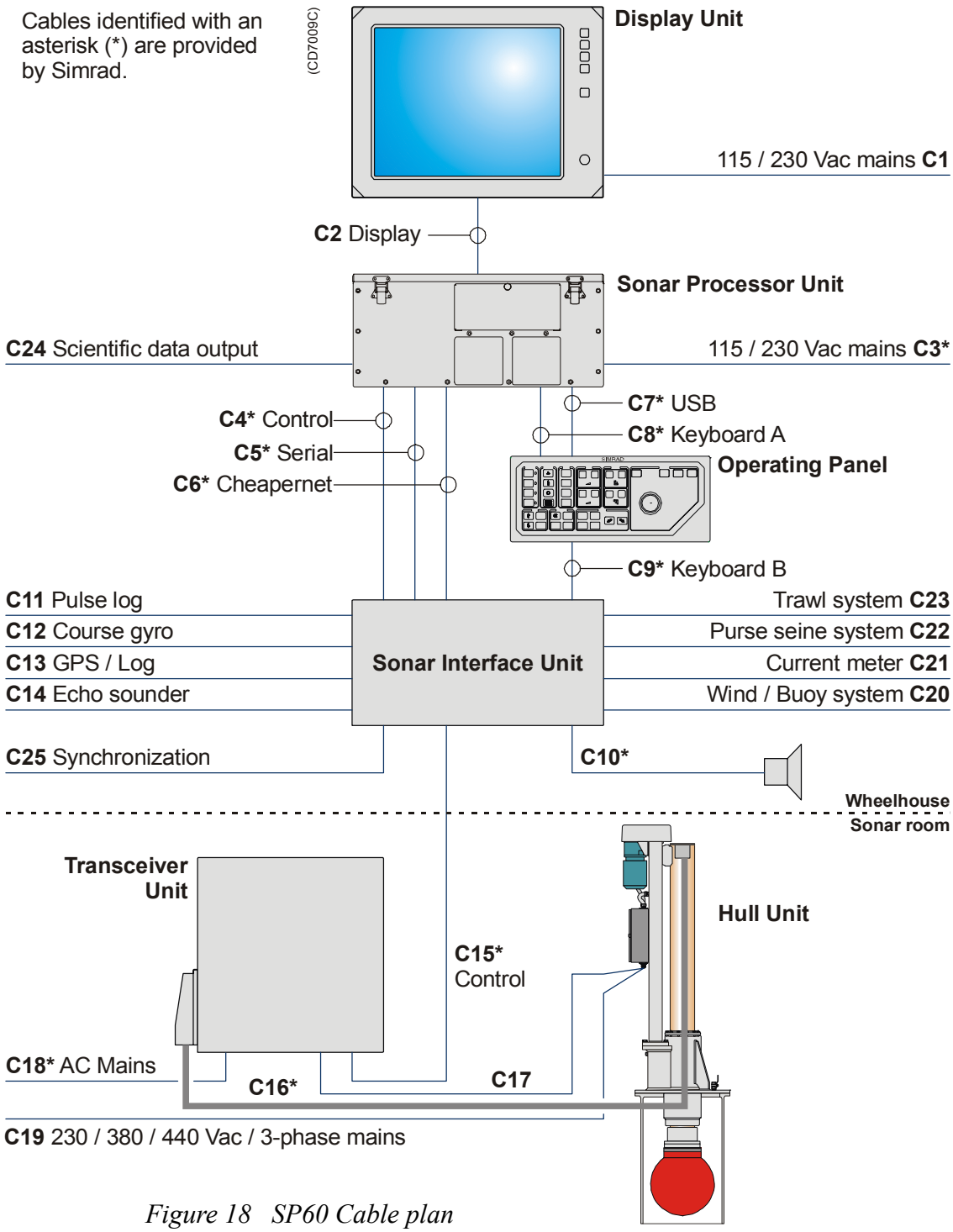


Figure 18 SP60 Cable plan

7.3 Cable specifications

The list below specifies each cable used on the SP60 sonar. References are made to detailed cable drawings.

Note that the Sonar Processor Unit provides a large number of connectors that are not used by the SP60 sonar. Those connectors are left out of the list below.

Installation procedures for the wheelhouse cables, sonar room cables and peripherals are provided as follows:

→ *Wheelhouse cabling, page 60.*

→ *Sonar room cabling, page 66.*

→ *Peripherals, page 75.*

C1 / C3 / C18 - AC Mains

These are standard AC mains cables. The computer and transceiver cables are supplied by Simrad, the display cable is provided by the display manufacturer.

→ *Cable details on page 181.*

C2 - Display

This is a standard VGA or DVI display cable. It is normally provided by the display manufacturer.

→ *VGA Cable details on page 184.*

C4 / C5 / C6 - Sonar Interface Unit

This are the control and signal cables between the Sonar Processor Unit and the Sonar Interface Unit. The cables are provided by Simrad.

→ *Cable details on page 173.*

C7 - Operating panel (USB)

This is a standard USB data cable. It is provided by Simrad.

→ *Cable details on page 185.*

C8 / C9 - Operating panel (Power and serial)

This is a special dual cable from the Operating Panel to the Sonar Processor Unit and the Sonar Interface Unit. The cable is provided by Simrad.

→ *Cable details on page 186.*

C10 - Loudspeaker

This is a special cable for connections between the loudspeaker and the Sonar Interface Unit. The cable is physically connected to the speaker, and thus provided by Simrad.

→ *Cable details on page 175.*

C11-C14 / C20-C25 Peripheral equipment

These are cables used to interface peripheral equipment. They are described in detail in chapter *Peripheral equipment*.

→ *See page 75.*

C15 - Transceiver Unit

This is a data cable from the Sonar Interface Unit in the wheelhouse to the Transceiver Unit in the sonar room. The cable is provided by Simrad.

→ *Cable details on page 178.*

C16 - Transducer cable

The transducer cables are provided by the manufacturer. They are physically connected to the top of the transducer shaft. All transducer cables are provided by Simrad.

C17 - Motor control

This cable is connected between the Transceiver Unit and the Motor Control Unit mounted on the Hull Unit.

→ *Cable details on page 180.*

Note that the physical properties of this cable is identical to those of C15. Therefore, any surplus of the C15 cable can be used.

C19 - Motor control mains

This cable provides AC mains to the Motor Control Unit. The cable must be provided by the installation shipyard.

→ *Cable details on page 182.*

7.4 Wheelhouse cabling

Introduction

Connections to the Sonar Processor Unit are made on the connectors on the rear side of the unit. The fixed connectors are specified on the identification panel, while the circuit board connectors are identified with **Jx** tags.

Note

The Sonar Processor Unit provides a large number of connectors that are not used by the SP60 sonar.

Connections to the Sonar Interface Unit are made on the terminal blocks and connectors on the main circuit board. To access to connectors, open the unit's lid. An identification panel is available inside the Sonar Interface Unit.

For connection of the peripheral equipment, refer to section *Peripheral equipment*.

→ *Refer to page 75.*

Connections

The illustrations below identify the main connectors on the Sonar Processor Unit and the Sonar Interface Unit.

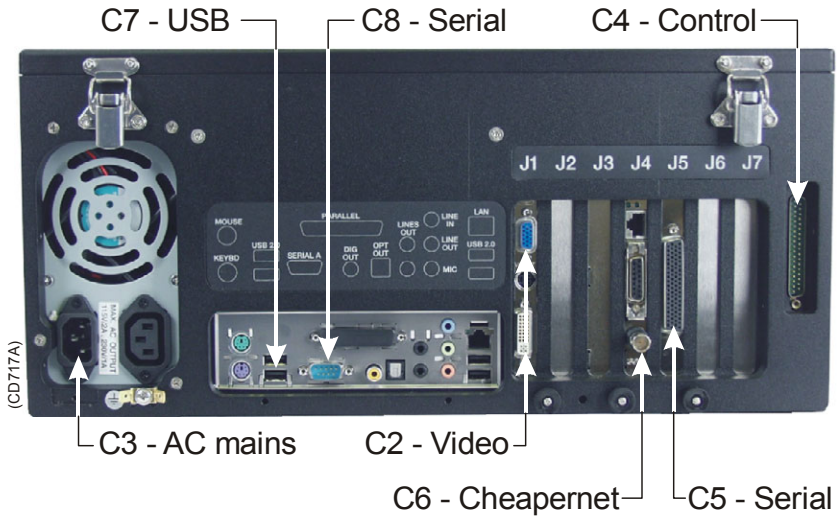


Figure 19 Connections to the Sonar Processor Unit

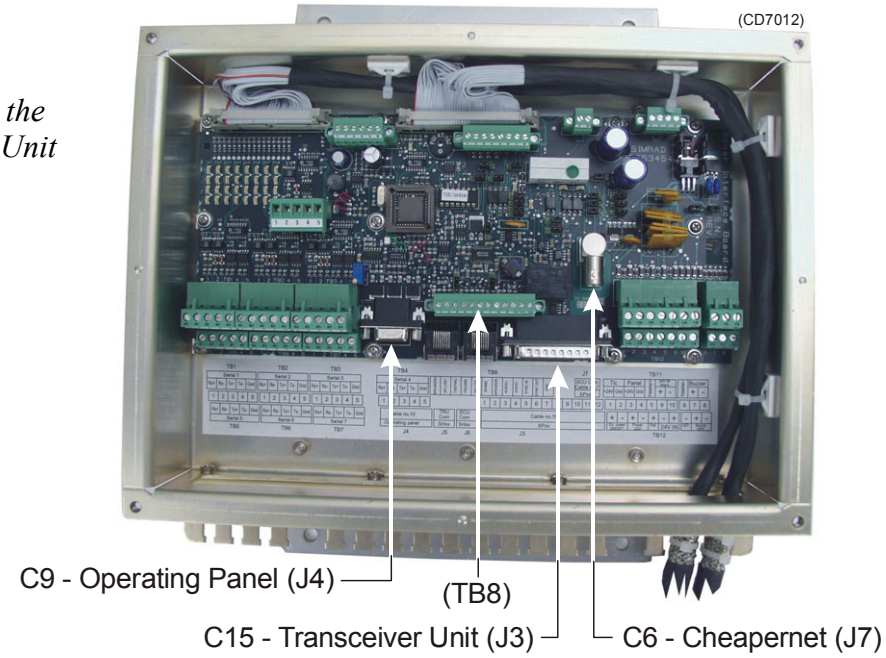


Figure 20 Connections to the Sonar Interface Unit

Cables

C1 - AC Power to the Display Unit

This is a standard mains supply cable. It is included in the delivery with the optional Simrad display units. The mains voltage for the Simrad LCD monitors is 115 or 230 Vac, and they will automatically sense the current supply voltage. For other type of displays, refer to the applicable documentation.

→ *Cable details, page 181.*

Observe the following procedure for the connection of the mains supply to the display unit.

☐ **1** Connect the mains supply cable between the mains connector at the rear side of the display unit and a normal mains outlet.

If the delivered cable connector does not fit, replace it with a suitable connector.

C2 - Display cable

This is a standard display cable, where VGA or DVI signal outputs may be used. The cable is normally attached to the display, and terminated in the computer end with a male 15-pin Delta connector (VGA) or a special DVI connector. The cable is normally supplied by the display manufacturer.

→ *VGA Cable details on page 184.*

Observe the following procedure for the connection of the display unit to the Sonar Processor Unit.

☐ **1** Connect the display cable to the appropriate connector on the circuit board in slot **J1**.

The circuit board in slot **J1** in the computer provides two Delta connectors. The top connector is for VGA, while the bottom is for DVI.

C3 - AC Mains to Sonar Processor Unit

This is a standard mains supply cable. It is secured to the rear side of the Sonar Processing Unit with a bracket. The mains voltage for the Sonar processing Unit is 115 or 230 Vac, and it will automatically sense the current supply voltage. The cable is provided by Simrad.

→ *Cable details, page 181.*

Observe the following procedure for the connection of the mains supply to the Sonar Processor Unit.

☐ **1** Connect the mains supply cable between the mains connector at the rear side of the display unit and a normal mains outlet.

☐ **2** Secure the plug on the rear side of the Sonar Processor Unit with the bracket.

If the delivered cable connector does not fit, replace it with a suitable connector.

C4 - Sonar Interface Control

This are the control signals between the Sonar Processor Unit and the Sonar Interface Unit. The cable is pre-connected to the Sonar Interface Unit, and is equipped with a 37-pin female Delta connector in the Sonar Processor Unit end. The cable length is 1.2 m.

☐ **1** Connect the plug to the connector on the far right hand side of the Sonar Processor Unit.

→ *Cable details on page 173.*

C5 - Sonar Interface Serial

This is the serial lines fed from the Sonar Interface Unit to the Sonar Processor Unit. The cable is pre-connected to the Sonar Interface Unit, and is equipped with a special multi-connector in the Sonar Processor Unit end. The cable length is 1.2 m.

☐ **1** Connect the plug to the connector on the circuit board in slot **J5** on the rear side of the Sonar Processor Unit.

→ *Cable details on page 173.*

C6 - Cheapernet communication

This is the Cheapernet signal cable between the Sonar Processor Unit and the Sonar Interface Unit. The cable is included in the delivery, and it is terminated with BNC connectors in both ends. The end with the T-connector must be connected to the Sonar Processor Unit.

☐ **1** Connect the Cheapernet cable with the T-connector to the BNC connector on the circuit board in slot **J4** on the rear side of the Sonar Processor Unit.

☐ **2** Connect the Cheapernet cable to the BNC connector **J7** in the Sonar Interface Unit.

→ *Cable details on page 174.*

C7 – Operating panel (USB)

This is a standard USB data cable. It connects between the Operating Panel and the Processor Unit. The cable is included in the standard delivery, and the cable length is 4,5 meters. The cable has a quadratic USB connector in the Operating Panel end, and rectangular USB connector in the Processor Unit end.

→ *Figure 21 shows the connection to the Operating Panel.*

→ *The figure on page 61 shows the connection to the Sonar Processing Unit.*

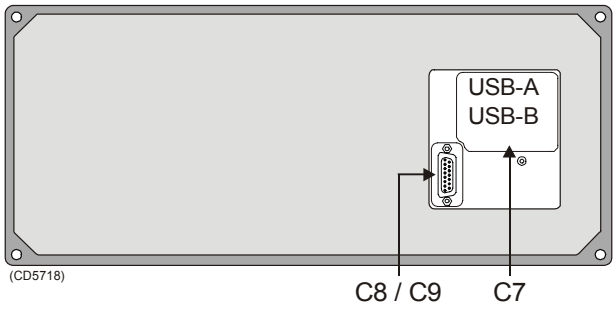
→ *Cable details on page 185.*

Observe the following procedure for the connection of the USB data cable.

☐ **1** Connect the quadratic USB connector to the Operating Panel.

☐ **2** Connect the rectangular USB connector to the lowest USB connector on the rear left hand side of the Sonar Processor Unit.

Figure 21 Connections to the rear side of the Operating Panel



C8 / C9 - Operating panel (Power and serial)

This is a special dual cable from the Operating Panel to the Sonar Processor Unit and the Sonar Interface Unit.

This dual cable has a common 15-pin Delta connector in the Operating Panel end, a 9-pin female Delta connector in the Sonar Processor Unit end (cable C8), and a 9-pin male Delta connector in the Sonar Interface Unit end (cable C9).

The cable is included in the standard delivery, and the cable length is 4,5 meter.

→ *Figure 21 shows the connections to the Operating Panel.*

→ *Cable details on page 186.*

Observe the following procedure for the connection of the panel cable.

☐ **1** Connect the 15-pin Delta connector to the Operating Panel.

☐ **2** Connect the 9-pin female Delta connector to the **Serial A** connector on the rear side of the Sonar Processor Unit.

☐ **3** Connect the 9-pin male Delta connector to the **J4** connector in the Sonar Interface Panel.

C10 - Loudspeaker

This is a special cable for connections between the Loudspeaker and the Sonar Interface Unit. The cable is included in the standard delivery, and is pre-connected to the loudspeaker. The cable length is 5 meters.

→ *Cable details on page 175.*

Observe the following procedure.

☐ **1** Mount the loudspeaker in an adequate position.

☐ **2** Connect the cable to the terminal **TB8** in the Sonar Interface Unit. The orange cable must be connected to **TB8-1** and the black cable to **TB8-7**.

C15 - Transceiver Unit

This is a data cable from the Sonar Interface Unit in the wheelhouse to the Transceiver Unit in the sonar room. The cable is included in the standard delivery with a length of 100 meters, and it has a pre-connected plug in the Sonar Interface Unit end.

→ *Cable details on page 178.*

☐ **1** Run the 100 m data cable from the wheelhouse to the sonar room.

- Note that the pre-connected plug will be connected to the Sonar Interface Unit in the wheelhouse at a later stage.

Note

The data cable from the wheelhouse to the sonar room must be supported and protected along its entire length using conduit and/or cable trays. The cable must not be installed in close proximity to high-power cables antenna cables or other possible sources of interference.

This cable must not be spliced. If it is not long enough, or if an accident occurs to it, contact your local dealer or Simrad for advice.

☐ **2** Do **not** connect the plug to the Sonar Interface Unit.

→ *The installation of this cable into the Transceiver Unit is described on page 68.*

7.5 Sonar room cabling

Introduction

All sonar room cabling must be performed as specified. The cable numbers used to identify the cables in the figures and following procedures are identical to those used in the cable plan and cable overview table.

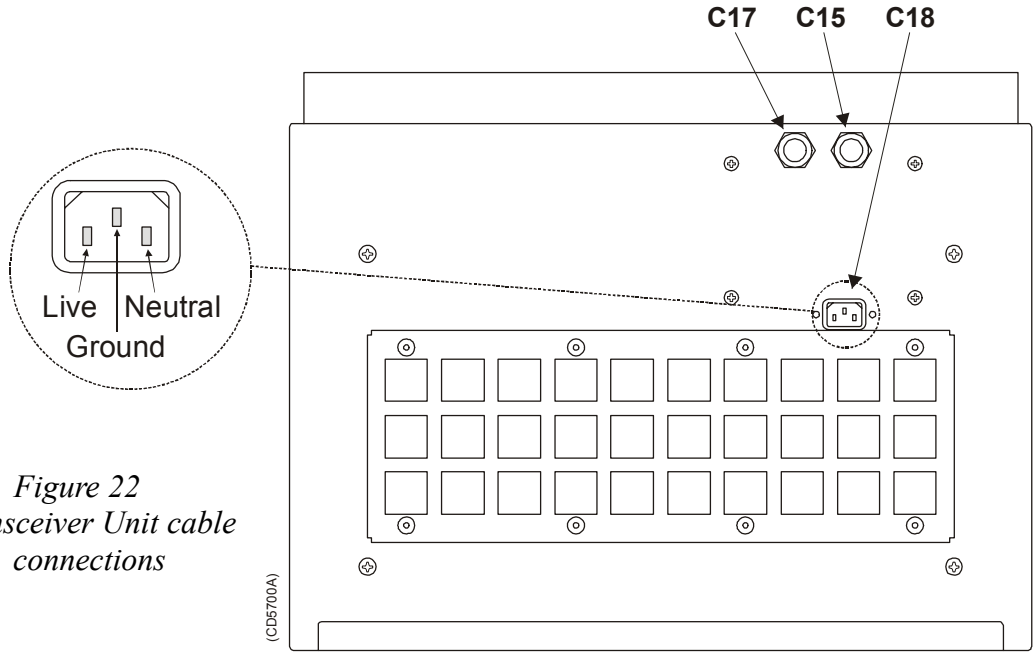


Figure 22
Transceiver Unit cable connections

Note

Due to the flexible shock mounting, all cables connected to the Transceiver Unit must have appropriate slack to allow for approximately 10 cm cabinet movement in all directions.

Cables

C17 - Motor control

This cable is connected between the Transceiver Unit and the Motor Control Unit mounted on the Hull Unit. Use the surplus of cable C15, or an equivalent type of cable.

→ *Refer to page 180 for detailed information about the cable and the connections to be made.*

Observe the following procedure. To ensure correct operation, tick off every item when the action has been carried out.

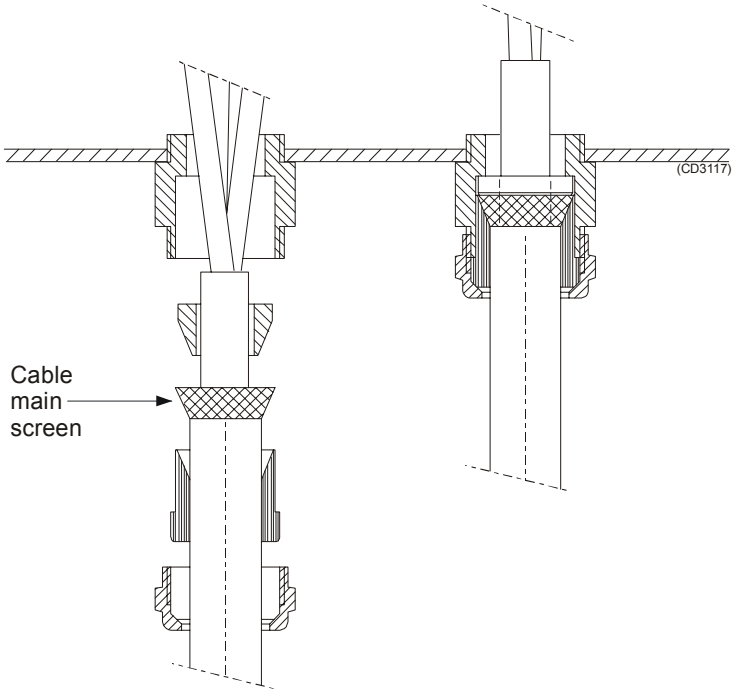
☐ **1** Use the cable gland on the left-hand side of the Transceiver Unit.

→ *The bottom of the Transceiver Unit is shown in figure 22.*

☐ **2** Terminate the cable shielding.

→ *Cable shielding is shown in figure 23.*

Figure 23 Termination of cable shielding



☐ **3** Terminate the seven cable pairs onto terminal block E201 in the Transceiver Unit.

- For the insulation of the shielding of each of the cable pairs, use part of the supplied cable sleeve.

→ *Refer to the cable connection drawing on page 180 for termination details for E201.*

☐ **4** Run the cable from the Transceiver Unit to the Motor Control Unit mounted on the gantry.

☐ **5** Use the cable gland on the right-hand side in the Motor Control Unit, and terminate the cable shielding in the cable gland.

→ *The cable shielding is described in figure 23 on page 67.*

→ *The interior of the Motor Control Unit is shown in figure 24.*

☐ **6** Create a small cable slack inside the Motor Control Unit as indicated in the figure.

☐ **7** Make the E301 connections in the Motor Control Unit according to the cable connection drawing.

- Note that the shielding of each cable pair shall not be connected in the Motor Control Unit.

→ *Refer to the cable connection drawing on page 180.*

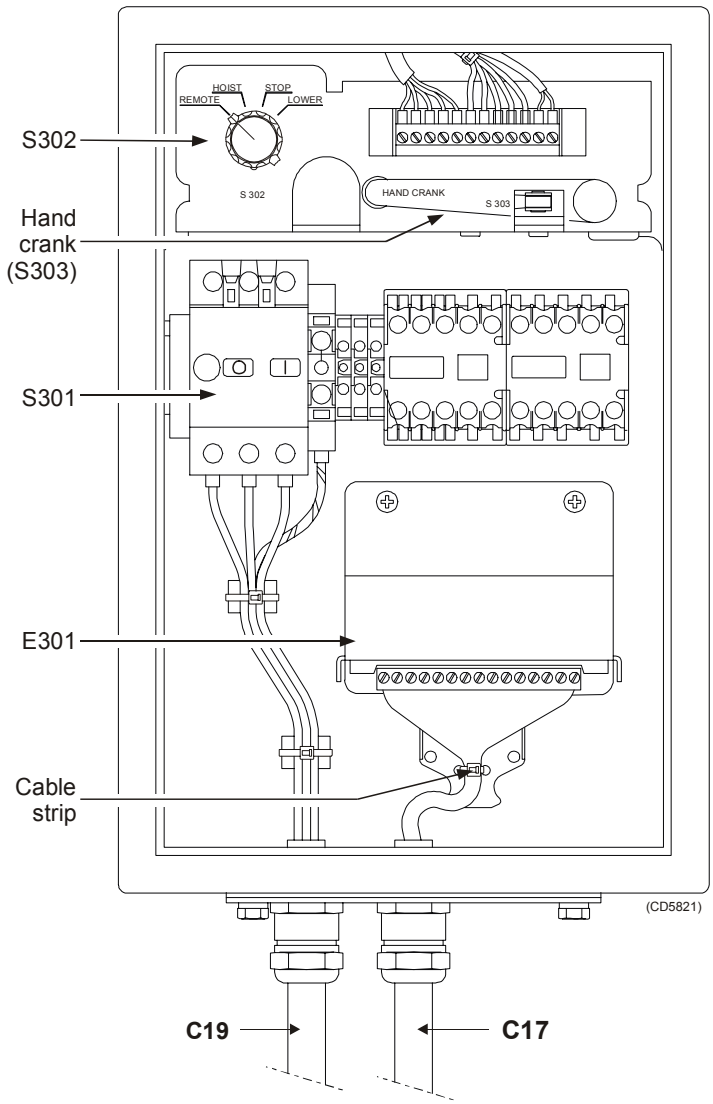


Figure 24 Connections to the Motor Control Unit

C15 - Sonar Interface Unit

This is the control and data cable from the Sonar Interface Unit in the wheelhouse to the Transceiver Unit in the sonar room. The cable is included in the standard delivery, with a length of 100 meters, and has a pre-connected plug in the wheelhouse end.

Note

Cable C17 from the Transceiver Unit to the Motor Control Unit must be connected before cable C15. This is necessary because cable C17 is connected to the bottom row of terminal E201.

Use the following procedure for connecting the cable C15 to the Transceiver Unit. To ensure correct operation, tick of every item when the action has been carried out.

☐ **1** Use the cable gland on the right-hand side in the Transceiver Unit as shown in the figure.

→ *The cable glands at the bottom of the Transceiver Unit are shown on figure 22 on page 66.*

☐ **2** Terminate the cable's shielding in the cable gland.

→ *The cable shielding is shown in figure 23 on page 67.*

☐ **3** Refer to the cable connection drawing for termination of the 8 cable pairs with shielding to the termination strip E201.

- For insulation of the shielding of each cable pairs, use part of the enclosed cable sleeve.

→ *Refer to the cable information on page 178.*

C19 - AC power for hoist/lower motor

This cable is used for the 3-phase mains supply for the hoisting and lowering motor on the Hull Unit. The cable's specifications are shown in the referenced cable drawing. The connections are made to the Motor Control Unit.

→ *Refer to the detailed cable drawing on page 182.*

Observe the following procedure:

☐ **1** Set the hoisting/lowering switch S302 in the Motor Control Unit to the **Stop** position.

☐ **2** Release the motor overload switch S301 in the Motor Control Unit by pressing the red button labelled **0**.

☐ **3** Use the cable gland shown on the left-hand side of the figure and terminate the cable shielding in the cable gland.

→ *Refer to figure 24 on page 68 and figure 23 on page 67.*

Caution ***Note that the cables 17 and 19 must be separated inside the Motor Control Unit. These cables must not be tied together.***

☐ **4** Connect the 3-phase mains power cable directly to the motor overload switch S301 according to the cable connection drawing.

- The grounding wire should be attached to the ground terminal beside the motor overload switch.

→ *Refer to the detailed cable drawing on page 182.*

☐ **5** Run the 3-phase mains power cable no. 19 from the Motor Control Unit to the ship's mains fuse board.

☐ **6** Disconnect the fuses and connect the 3-phase main cable to the ship's mains fuse board.

C18 - AC power to the Transceiver Unit

This cable is included in the delivery. It is used for the mains supply to the Transceiver Unit. The mains power can be 115 or 230 Vac.

Observe the following procedure for the connection of the mains power.

☐ **1** Pull out the mains power input connector **P201** on the Transceiver Unit's power supply.

→ *Refer to figure 25 on page 70 for location of the power supply and the connector.*

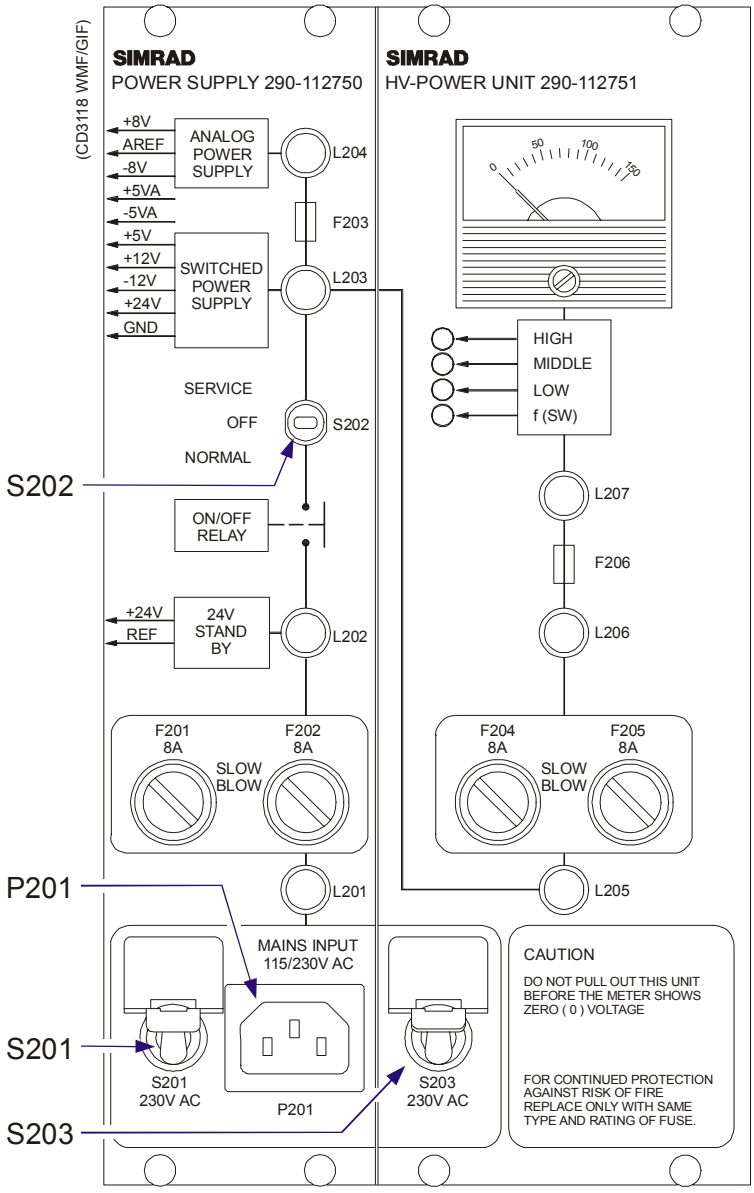


Figure 25 Power units in the Transceiver Unit

☐ **2** Set the mains voltage selector switch **S201** on the Power Supply and **S203** on the HV Power Unit to correspond to the correct mains voltage (115 Vac or 230 Vac).

☐ **3** Set the service switch **S202** on the Power Supply to the **Off** (middle) position.

☐ **4** Connect the mains power cable to a normal mains outlet in the sonar room.

- If the delivered cable connector does not fit use an adaptor, or replace with a suitable plug.

→ *For connection of the mains cable, refer to figure 22 on page 66.*

C16 - Transducer cable

The transducer cables are provided by the manufacturer. They are physically connected to the top of the transducer shaft.

Caution ***<u>Do not</u> mount the flexible transducer cable to the Transceiver Unit.***

7.6 Basic cabling requirements

Cable trays

All permanently installed cables associated with the system must be supported and protected along their entire lengths using conduits and/or cable trays. The only exception to this rule is over the final short distance (max. 0.5 metre) as the cables run into the cabinets/units to which they are connected. These short unsupported lengths are to allow the cabinets to move on their shock mounts, and to allow maintenance and replacements.

- Wherever possible, cable trays must be straight, accessible and placed so as to avoid possible contamination by condensation and dripping liquids (oil, etc.). They must be installed remote from sources of heat, and must be protected against physical damage. Suitable shields must be provided where cables are installed in the vicinity of heat sources.
- Unless it is absolutely unavoidable, cables should not be installed across the vessel's expansion joints. If the situation is unavoidable, a loop of cable having a length proportional to the possible expansion of the joint must be provided. The minimum internal radius of the loop must be at least twelve times the external diameter of the cable.
- Where a service requires duplicate supply lines, the cables must follow separate paths through the vessel whenever possible.
- Signal cables must not be installed in the same cable tray or conduit as high-power cables.
- Cables containing insulation materials with different maximum-rated conductor temperatures should not be bunched together (that is, in a common clip, gland, conduit or duct). When this is impractical, the cables must be carefully bunched such that the maximum temperature expected in any cable in the bunch is within the specifications of the lowest-rated cable.
- Cables with protective coverings which may damage other cables should not be bunched together with other cables.
- Cables having a copper sheath or braiding must be installed in such a way that galvanic corrosion by contact with other metals is prevented.
- To allow for future expansion of the system, all cables should be allocated spare conductor pairs. Also, space within the vessel should be set aside for the installation of extra cables.

Radio Frequency interference

All cables that are to be permanently installed within 9 m (30 ft) of any source of Radio Frequency (RF) interference such as a transmitter aerial system or radio cabin, must, unless shielded by a metal deck or bulkhead, be adequately screened by sheathing, braiding or other suitable material. In such a situation flexible cables should be screened wherever possible.

It is important that cables, other than those supplying services to the equipment installed in a radio room, are not installed through a radio room. Cables which must pass through a radio room must be screened by a continuous metal conduit or trunking which must be bonded to the screening of the radio room at its points of entry and exit.

Physical protection

Cables exposed to the risk of physical damage must be enclosed in a steel conduit or protected by a metal casing unless the cable's covering (e.g. armour or sheath) is sufficient to protect it from the damage risk.

Cables exposed to an exceptional risk of mechanical damage (for example in holds, storage-spaces and cargo-spaces) must be protected by a suitable casing or conduit, even when armoured, if the cable covering does not guarantee sufficient protection for the cables.

Metallic materials used for the physical protection of cables must be suitably protected against corrosion.

Grounding

All metallic cable coverings (armour, lead sheath etc.) must be electrically connected to the vessel's hull at both ends except in the case of final sub-circuits where they should be connected at the supply end only.

Grounding connections should be made using a conductor which has a cross-sectional area related to the current rating of the cable, or with a metal clamp which grips the metallic covering of the cable and is bonded to the hull of the vessel. These cable coverings may also be grounded by means of glands specially intended for this purpose and designed to ensure a good earth connection. The glands used must be firmly attached to, and in good electrical contact with, a metal structure grounded in accordance with these recommendations.

Electrical continuity must be ensured along the entire length of all cable coverings, particularly at joints and tappings. In no case should the lead-sheathing of cables be used as the only means of grounding cables or units.

Metallic casings, pipes and conduits must be grounded, and when fitted with joints these must be mechanically and electrically grounded.

Cable connections

All cable connections are shown on the applicable cable plan and interconnection diagrams.

Where the cable plan shows cable connections outside an equipment box outline, the connections are to be made to a plug or socket which suits the plug or socket on that particular item of equipment.

Where two cables are connected in series via a junction box or terminal block, the screens of both cables must be connected together but not grounded.

Cable terminations

Care must be taken to ensure that the correct terminations are used for all cable conductors, especially those that are to be connected to terminal blocks. In this case, crimped sleeve-terminations must be fitted to prevent the conductor core from fraying and making a bad connection with the terminal block. It is also of the utmost importance that where crimped terminations are used, the correct size of crimp and crimping tool are used. In addition, each cable conductor must have a minimum of 15 cm slack (service loop) left before its termination is fitted.

Cable identification

Cable identification codes corresponding to the cable number shown in the cable plan must be attached to each of the external cables. These identification codes should be positioned on the cable in such a way that they are readily visible after all panels have been fitted. In addition, each cable conductor should be marked with the terminal board number or socket to which it is connected.

8 PERIPHERAL EQUIPMENT

8.1 General

Introduction

It is not necessary to make the connection of the peripheral equipment before the start-up procedure is finished, and this equipment may therefore be connected later.

However, do not connect the termination plugs for the auxiliary equipment to the Sonar Interface Unit before mentioned in a later chapter.

Required inputs

The SP60 sonar system requires input from both a **speed log** and a **course gyro**. Inaccurate data from either of these instruments will result in an incorrect indication of vessel and target movements.

→ *Speed log, page 77.*

→ *Course gyro, page 79.*

Additional inputs

The following peripheral sensors may be connected to the SP60 sonar:

→ *(D)GPS, page 80.*

→ *Echo sounder, page 81.*

→ *Trawl System, page 82.*

→ *Purse seine system, page 83.*

→ *Current meter system, page 84.*

→ *Radio buoy system, page 85.*

→ *Trackball and mouse, page 86.*

Physical connections to the Sonar Interface Unit

The figure below shows the positions for the different auxiliary connections on the Sonar Interface Unit.

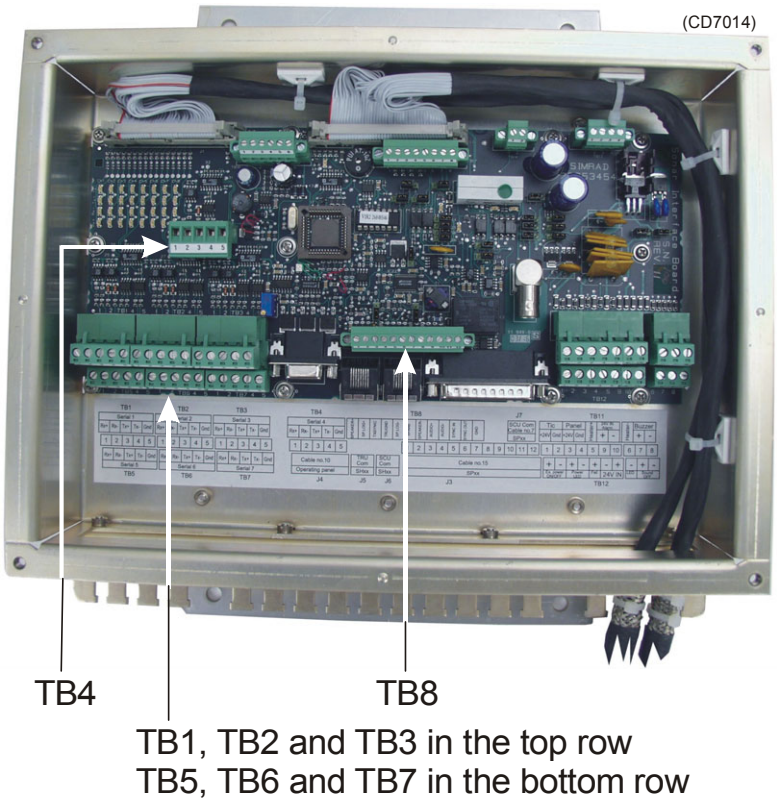


Figure 26 Serial line connections to the Sonar Interface Unit

TB1 through TB7 are all RS-232 serial line connections. These may be used for any of the serial line auxiliary inputs. Which input is used for which peripheral device is defined in the installation menu when the peripheral equipment is set up and tested.

TB8 is used for speed log connection.

Note that the tag blocks used for TB1 through TB7 are all plug-in. TB4 and TB8 must be pulled “upwards”, while the others must be pulled “downwards” towards the unit’s cable exits.

8.2 Speed log connection

Overview

The sonar can read the speed information from one of the following three sources (tick off for the type which will be connected):

- ☐ Pulse log (200 pulses/nautical mile)
- ☐ Speed log with RS-232 serial line output
- ☐ (D)GPS serial line (RS-232)

The connection of these different sources are described in the following chapters.

Pulse log (200 pulses/nautical mile)

For any type of pulse log output (relay, open collector, or opto-coupler), the output must be free from other connections.

The figure to the left shows the connection of a pulse log with relay output to terminal TB8 in the Sonar Interface Unit.

For connection of a pulse log with open collector or opto-coupler output, the connection must be made between **SP.LOG+** (on TB8-2) and **SP.LOG-** (on TB8-5). If this is the case, be aware of the polarization.

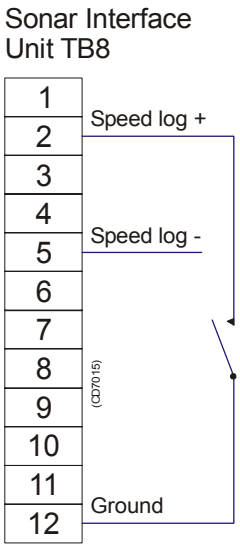


Figure 27 Connections for pulse log with relay output

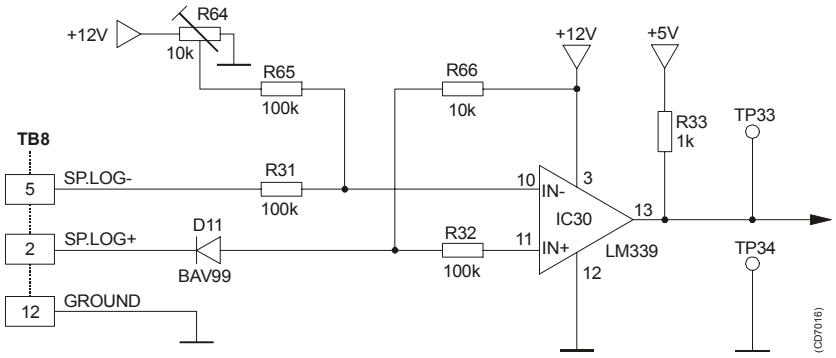


Figure 28 Pulse log interface

Speed log with RS-232 output

The sonar can also read the speed log data from a RS-232 serial line with a standard NMEA 0183 telegram format. The telegram can contain both the speed and the course data.

Refer to the cable connection drawing for termination of the serial line data in the Sonar Interface Unit.

→ *Refer to drawing on page 176.*

For connection to the speed log, refer to the applicable log documentation.

Speed data from (D)GPS (RS-232)

The (D)GPS output data will normally contain the speed log information. In such case, this serial line can be used for both the position and speed data.

→ *(D)GPS connection is described on page 80.*

8.3 Course gyro connection

Overview

The SP60 sonar can read the course information from an RS-232 serial line. In case where only a 3-phase synchro or stepper signal is available, an optional Gyro Interface Unit must be used for converting these signals to RS-232 serial line format.

→ *More information about the Gyro Interface Unit can be found on page 6.*

Gyro with RS-232 serial line output

The course data on the RS-232 serial line must be on a standard NMEA 0183 telegram format. The telegram can contain both the speed and the course data.

→ *Refer to the telegram format description on page 155.*

Refer to the cable connection drawing for termination of the serial line data in the Sonar Interface Unit.

→ *Refer to the drawing on page 176.*

For connection to the course gyro, refer to the applicable gyro documentation.

Gyro with 3-phase synchro or stepper output

If only a 3-phase synchro or stepper signal is available, an optional gyro interface unit must be used to convert these signals to RS-232 serial line format. An **LR40** Digital Gyro Repeater may be used for interfacing the following signals:

- 3-phase synchro signal, 20-115V L-L, 50/60/400 Hz, gear ratio 1:360 or 1:180
- 3-phase stepper signal, 20-115V L-L, gear ratio 1:360 or 1:180

The LR40 Digital Gyro Repeater can be delivered from Simrad on part number 298-078535.

→ *For connection to the LR40 Digital Gyro Repeater, refer to the LR40 Instruction Manual.*

Refer to the cable connection drawing for termination of the serial line data in the Sonar Interface Unit.

→ *Refer to the drawing on page 176.*

8.4 (D)GPS connection

A (D)GPS may be connected to the SP60 sonar to indicate the latitude and longitude position of the vessel, cursor, markers and targets. In addition to the navigational data, the (D)GPS may also be used for the input of the speed log information. Most (D)GPS systems are equipped to present the course information, but this data is generally too inconsistent to provide a stable sonar presentation.

The sonar can read the (D)GPS data from an RS-232 serial line with a standard NMEA 0183 telegram format.

Refer to the cable connection drawing for termination of the serial line data in the Sonar Interface Unit.

→ *Refer to the drawing on page 176.*

For connection to the (D)GPS log, refer to the applicable (D)GPS documentation.

8.5 Echo sounder connection

To provide depth information on the sonar, an echo sounder with standard NMEA 0183 output format (RS-232 serial line) may be connected. Most Simrad echo sounders have the depth output available on an RS-232 serial line.

Refer to the cable connection drawing for termination of the serial line data in the Sonar Interface Unit.

→ *Refer to the drawing on page 176.*

For connection to the echo sounder, refer to the applicable echo sounder documentation.

8.6 Trawl system connection

The SP60 sonar can read the trawl data from a Simrad FS Trawl sonar or ITI (Integrated Trawl Instrumentation) system. The communication is achieved using a RS-232 serial line.

When connecting the FS Trawl sonar to the SP60 Sonar Interface Unit the trawl depth will automatically be shown in accordance with the surface, targets and bottom in the vertical modes on the sonar.

When the ITI trawl system is connected to the SP60 sonar, the information exchanged between the ITI and sonar is:

ITI to sonar:

- Trawl position relative to vessel
- Depth of trawl below surface
- Trawl headrope to footrope distance
- Trawl door spread
- Trawl filling
- Water temperature at trawl

Sonar to ITI:

- Position of target or marker

Refer to the cable connection drawing for termination of the serial line data in the Sonar Interface Unit.

→ *Refer to the drawing on page 176.*

For connection to the trawl system, refer to the RS-232 output in the applicable trawl system documentation.

8.7 Purse seine system connection

To provide purse seine depth information on the sonar's display, Simrad PI30 Purse seine system may be connected.

Refer to the cable connection drawing for termination of the serial line data in the Sonar Interface Unit.

→ *Refer to the drawing on page 176.*

8.8 Current meter

The SP60 sonar can read the data from the following current meter systems:

- Kaijo DCG-200

The interface is based on an RS-232 serial line.

Refer to the cable connection drawing for termination of the serial line data in the Sonar Interface Unit.

→ *Refer to the drawing on page 176.*

For connection to the current meter system, refer to the RS-232 output in the applicable current meter documentation.

8.9 Radio buoys

The SP60 sonar can read the data from one of the following GPS based radio buoy systems:

- SERPE
- Ariane
- Ryokusei

All these systems are interfaced by means of an RS-232 serial line.

Refer to the cable connection drawing for termination of the serial line data in the Sonar Interface Unit.

→ *Refer to the drawing on page 176.*

For connection to the radio buoy system, refer to the RS-232 output in the applicable radio buoy system documentation.

8.10 Trackball / mouse connection

In addition to the standard operating panel, an extra trackball or mouse with USB interface may be connected to the SP60 Sonar Processor Unit. In such case, all sonar operation may be controlled from this device.

Use any available USB port on the Sonar Processor Unit to connect the pointing device.

9 START-UP PROCEDURES

9.1 Introduction

The procedures in this chapter shall be carried out once all the hardware units have been installed, and the cabling is finished. When you perform the procedures, make sure that you only perform those tasks described, and in the given order. Also, check off every item in the procedure as you carry on.

The following procedures shall be performed:

→ *Checklist before start-up commences, page 88.*
→ *Staring the stand-by power supply, page 89.*
→ *Staring up the Hull Unit, page 91.*
→ *Starting the wheelhouse units, page 97.*
→ *Checking the Operator Panel, page 99.*
→ *Checking the hoisting and lowering system, page 104.*
→ *Starting up the Transceiver Unit, page 110.*
→ *Self-noise test, page 112.*
→ *System start-up, page 113.*
→ *Alignment of the sonar picture, page 118.*
→ *Alignment of the stabilization offset, page 120.*
→ *Defining own ship parameters, page 122.*

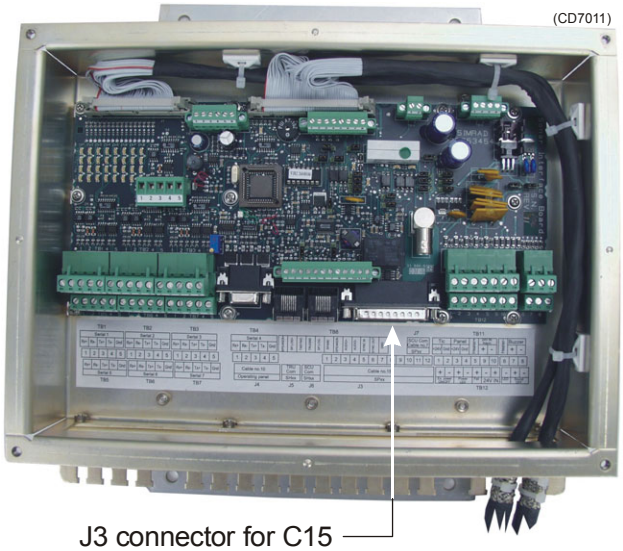
9.2 Check-list before start-up commences

Before you commence with the start-up procedure, check the following items. To ensure correct operation, tick off every item when the action has been carried out.

Processor Unit

☐ **1** Check that the connector on cable **C15** from the Transceiver Unit is disconnected from the Sonar Interface Unit in the wheelhouse.

Figure 29 C15 connects to socket J3 in the Sonar Interface Unit



Transceiver Unit

☐ **2** Check that the ship's mains fuses to the Transceiver Unit are disconnected.

☐ **3** Check that the mains input connector **P201** on the power supply in the Transceiver Unit is disconnected.

→ *Refer to figure 30 on page 89.*

☐ **4** Check that the transducer plug is not connected to the left-hand side of the Transceiver Unit.

Hull Unit

☐ **5** Check that the ship's mains fuses to the Hull Unit are disconnected.

9.3 Starting up the stand-by power supply

In order to start up the sonar units, the +24 Vdc stand-by power supply in the Transceiver Unit must be started first.

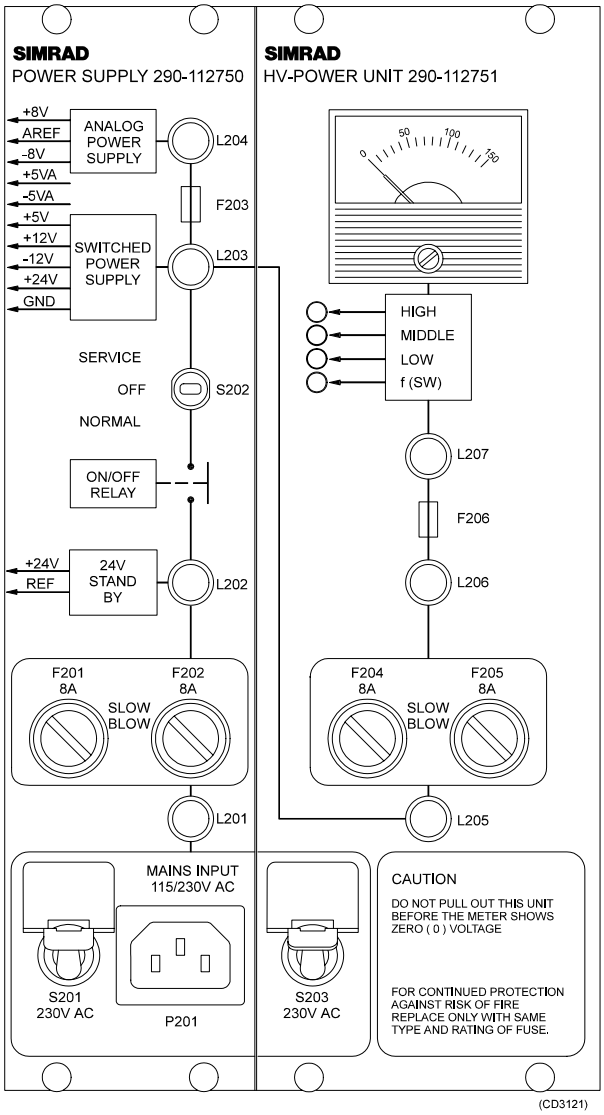


Figure 30 The Transceiver Unit power system

Observe the following procedure to start up the stand-by power supply. To ensure correct operation, tick off every item when the action has been carried out.

☐ **1** Check that the mains input connector **P201** on the front of the power supply in the Transceiver Unit is disconnected.

→ *Refer to figure 30.*

☐ **2** Check that the switch **S202** on the front of the power supply is set in the **Off** (middle) position.

☐ **3** Insert the mains fuses for the Transceiver Unit on the ship's mains fuse box.

☐ **4** Measure the mains voltage supplied to the Transceiver Unit.

- Write down the measured voltage here:

Supply voltage (Vac):	

☐ **5** Check that the voltage selector switches, **S201** on the power supply and **S203** on the HV power unit, correspond to the measured voltage (115 Vac or 230 Vac position).

☐ **6** Reinsert the mains input connector **P201** on the front of the power supply.

☐ **7** Check that lamps **L201** and **L202** on the front of the power supply illuminate.

☐ **8** Check that the small LED (Light Emitting Diode) for the +24 Vdc stand-by power on the Transceiver Interface Board (TIB) illuminates.

- Refer to the indicator on the front of the power supply.

The +24 Vdc stand-by power is now supplied both to the Hull Unit and to the connector for the Sonar Interface Unit.

9.4 Starting up the Hull Unit

Introduction

Observe the following procedure to start up the Hull Unit. To ensure correct performance, tick off every item when the action has been carried out.

WARNING

Before starting up the sonar equipment on a recently launched vessel, make sure the depth under the keel is sufficient for the transducer to be lowered safely.

When starting up the equipment on board a vessel in dry dock, check first under the vessel and inside the sonar room. Personnel, tools and other potential obstructions must be kept clear of the transducer and related lowering and hoisting machinery to avoid personal injury or damage to the equipment.

Functional check

Before you start the functional check, make sure that the mains fuses for the hull unit has been disconnected in the fuse box. This check will only require the +24 Vdc standby power from the Transceiver Unit.

☐ **1** Use a spanner to open the door on the Motor Control Unit.
- The unit is mounted on the Hull Unit.

☐ **2** Press the red button marked **0** on the motor overload switch **S301** in the Motor Control Unit.

→ *Refer to figure 31 on page 92.*

☐ **3** Check that the hoisting/lowering switch **S302** in the Motor Control Unit is set in the **Stop** position.

☐ **4** Remove the plastic plug on the top cover of the Hull Unit.

☐ **5** Locate the hand crank inside the Motor Control Unit, and mount the hand crank onto the stub shaft through the hole in the top cover.

☐ **6** Turn the hand crank counter-clockwise to lower the transducer manually approximately 10 cm (4”).

☐ **7** Remove the hand crank from the stub shaft, but do not place it into the Motor Control Unit yet.

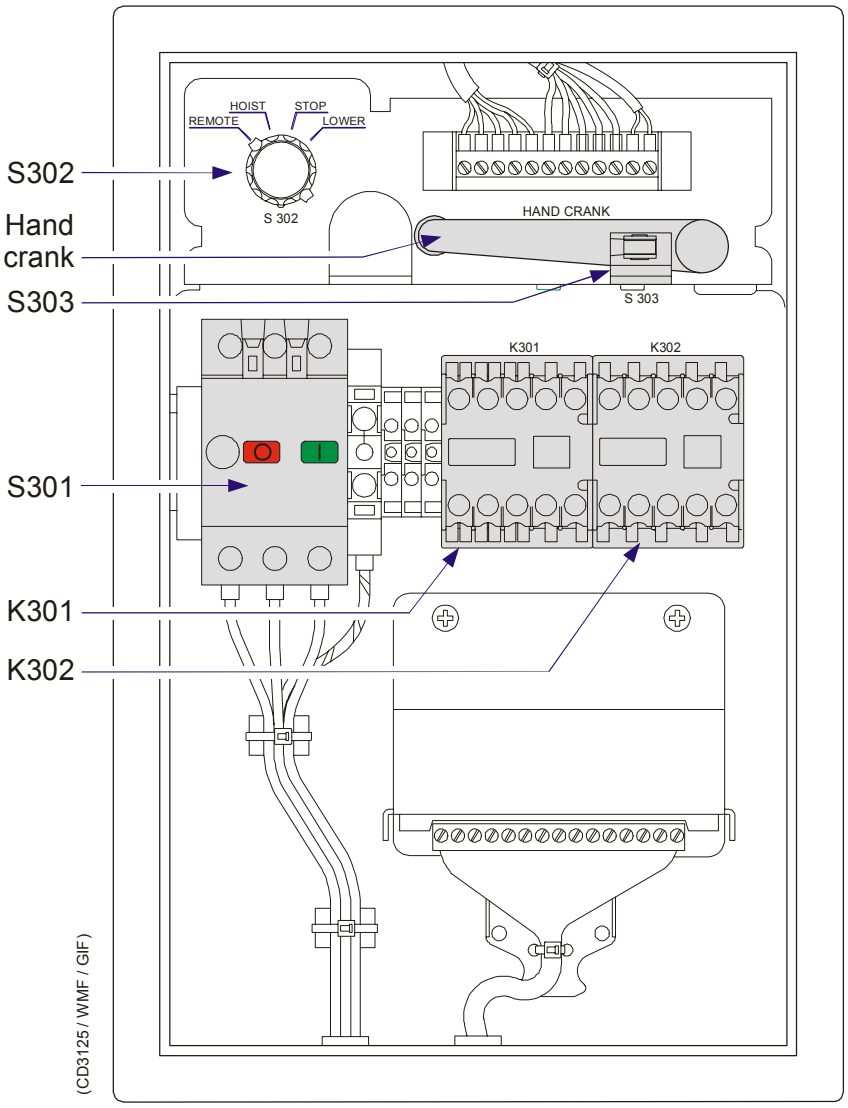


Figure 31 The Motor Control Unit

- ☐ **8** Set the hoisting/lowering switch **S302** to **Hoist** position, and check that the hoisting contactor **K301** is activated when pressing the hand crank safety switch **S303**.
- ☐ **9** Set the hoisting/lowering switch **S302** to the **Lower** position and check that the lowering contactor **K302** is activated when pressing the hand crank safety switch **S303**.
- ☐ **10** Set the hoisting/lowering switch **S302** to the **Stop** position.
- ☐ **11** Place the hand crank back into its storage position in the Motor Control Unit.
- ☐ **12** Activate the hoisting contactor **K301** by setting the hoisting/lowering switch **S302** to **Hoist** position, and check if the contactor is deactivated when pressing the upper limit switch **S304** upwards.

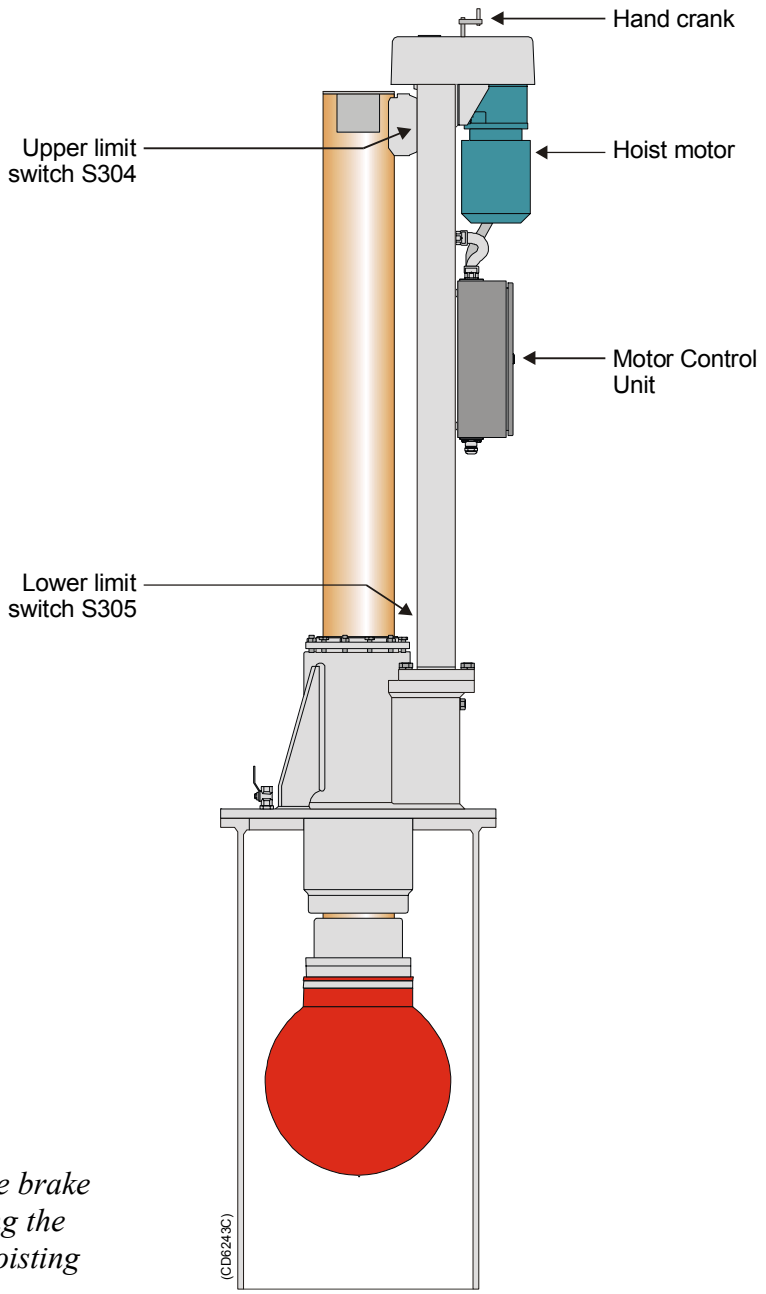


Figure 32 Location of the brake release screw, positioning the hand crank for manual hoisting

☐ **13** Activate the lowering contactor **K302** by setting the hoisting/lowering switch **S302** to **Lower** position, and check if the contactor is deactivated when pressing the lower limit switch **S305** downwards.

☐ **14** Set the hoisting/lowering switch **S302** to **Stop** position.

Apply 3-phase AC power

You will now apply 3-phase mains power to the hull unit.

☐ **1** Reinsert the 3-phase mains fuses for the hull unit in the ship's fusebox.

☐ **2** Measure the three-phase voltage on the terminals of the motor overload switch **S301** in the motor control unit.

- Write down the measured voltage here:

Supply voltage (Vac):	

WARNING **The mains voltage is lethal. Observe the safety precautions described in the general safety rules.**

→ *Refer to page 9.*

Re-wire for 230 Vac 3-phase

The hoist/lower motor is normally pre-wired for 380 / 440 Vac three-phase. If the measured three-phase voltage is 230 Vac, the motor must be rewired.

☐ **1** Remove the 3-phase mains fuses for the hull unit in the ship's fusebox.

☐ **2** Remove the cover for the mains connection to the motor.

→ *Refer to figure 33 on page 94.*

☐ **3** Rearrange the motor connections so that they correspond to the measured voltage.

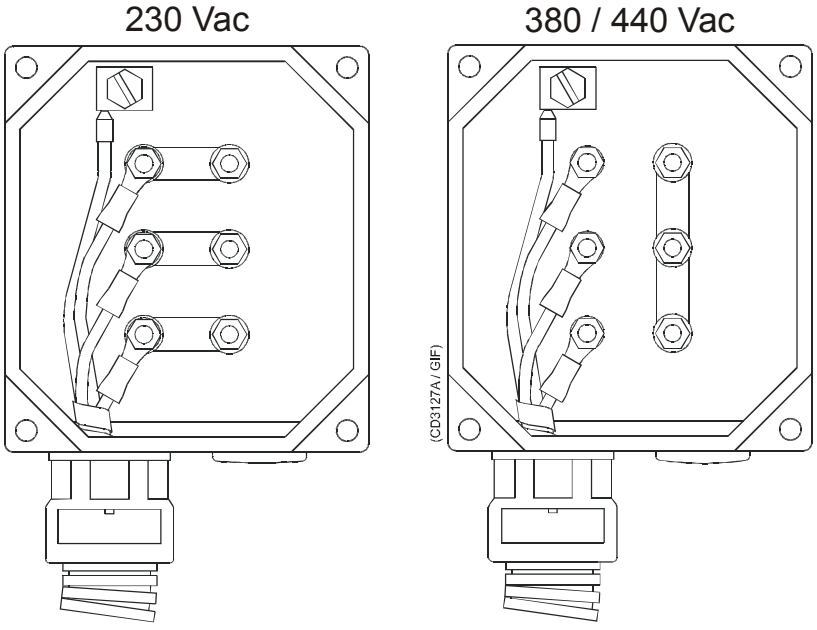


Figure 33 Mains connection to the motor

☐ **4** Adjust the release current on the motor overload switch **S301** according to the three-phase voltage:

- 230 Vac: 5.5 A
- 380 / 440 Vac : 4 A (minimum)

☐ **5** Reinsert the 3-phase mains fuses for the hull unit in the ship's fusebox.

Functional check with power

The hull unit is now all powered up, and the final functional test can take place.

☐ **1** Remove the hand crank from its storage position.

☐ **2** Set the motor overload switch **S301** to normal position by pressing the black button marked "1".

☐ **3** Set the hoisting/lowering switch **S302** to **Lower**.

☐ **4** Check the training direction of the hoisting/lowering motor by briefly pressing the hand crank safety switch **S303**.

☐ **5** If the transducer shaft was hoisted, perform the following procedure:

a Disconnect the ship's 3-phase mains fuses

b Change two of the connections to the terminals on the motor overload switch **S301**.

c Reinsert the 3-phase mains fuses in the ship's fusebox.

☐ **6** Set the hoisting/lowering switch **S302** to **Stop**.

☐ **7** Put the the hand crank back to its storage position in the Motor Control Unit.

☐ **8** Check if there is sufficient space under the keel to lower the transducer.

☐ **9** Make sure that the flexible transducer cable is in such a position that the transducer can be lowered without stretching or hard-bending the cable.

Note *Watch this carefully during the next steps in this procedure!*

☐ **10** Set the hoisting/lowering switch **S302** to the **Lower** position to completely lower of the transducer.

- Lowering will be stopped automatically when the top of the transducer shaft makes contact with the lower limit switch **S305**.

☐ **11** Set the hoisting/lowering switch to the **Hoist** position to completely hoist the transducer.

- Hoisting will be stopped automatically when the top of the transducer makes contact with the upper limit switch **S304**.

☐ **12** Repeat the hoisting/lowering operation to find the best position for a permanent fastening of the flexible transducer cable.

☐ **13** Set the hoisting/lowering switch to **Stop**.

☐ **14** Release the motor overload switch **S301** by pressing the red button marked **0**. This will prevent unwanted lowering of the transducer.

9.5 Starting up the Wheelhouse Units

Introduction

If the AC mains plug on the SP60 Sonar Processor Unit has been disconnected, the initial start of the sonar must be made by pressing the start switch **S101**. This switch is located behind the small lid on the front panel of the Sonar Processor Unit.

The AC mains plug must be disconnected when the vessel is in dry dock etc. This in order to prevent inadvertent use of the sonar, which is such case could cause serious damage to the system.

Start up

Observe the following procedure for starting up the sonar.

☐ **1** Connect the Sonar Processor Unit's AC mains plug.

☐ **2** Press the **Power** button on the display unit.

- Check that the text **Sync...** appears on the display**.** after approximately 10 seconds.

☐ **3** Locate the start switch **S101** behind the front door on the front panel of the Processor Unit, and press the switch for approximately two seconds.

☐ **4** Check that the green LED beside the **Power** button on the Sonar Operating Panel starts blinking.

- The sonar is now loading up the sonar programme, and after approximately two minutes, the sonar menu will be displayed.

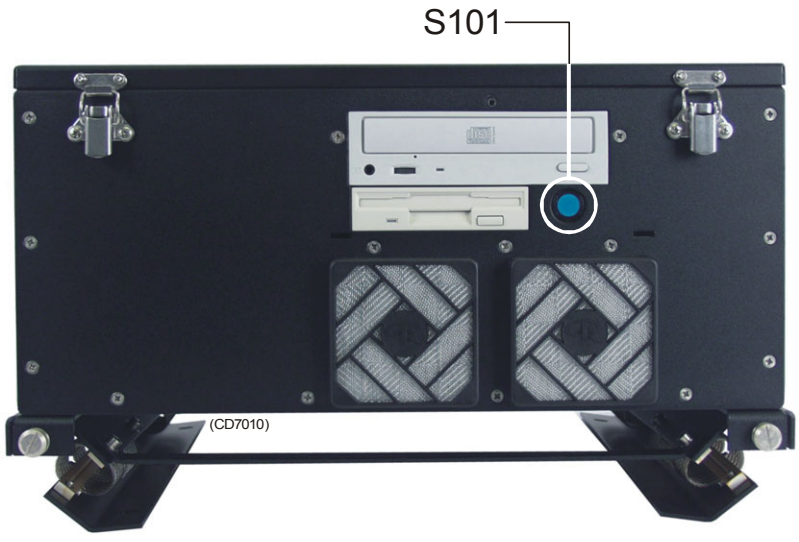


Figure 34 Location of switch S101

Display set-up

Observe the following procedure to set up the display and retrieve simulated sonar echoes.

☐ **1** Refer to the instruction manual for the display unit, and adjust the picture size so the grey picture frame is shown in the outmost part of the display frame.

☐ **2** Use the trackball and the **Select** button on the Operating Panel, and observe this procedure to obtain a simulated echo on the screen.

a Move the cursor to the **Setup** tab on the right-hand side of the main menu, and press the **Select** button.

- The **Setup** menu will be displayed.

b Move the cursor to the **Test...** button in the **Setup** menu, and press **Select**.

- The **System test** menu will now appear in the menu field.

c Move the cursor to the **Installation Menu** button and press **Select**.

- The **Installation menu** will now appear on the top of the screen.

d Move the cursor to **Simulation** and press the **Select** button. Select **Modes** and then **Auto**.

☐ **3** Check that simulated echoes are displayed on the screen after a few seconds.

- If not, check that the tilt angle in the upper left-hand corner is set to 0 degrees.

9.6 Checking the Operating Panel

Introduction

The simulated echoes makes it possible to test out most of the operational functions without starting up the Transceiver Unit.

→ *The layout of the Operating Panel is shown in figure 35*

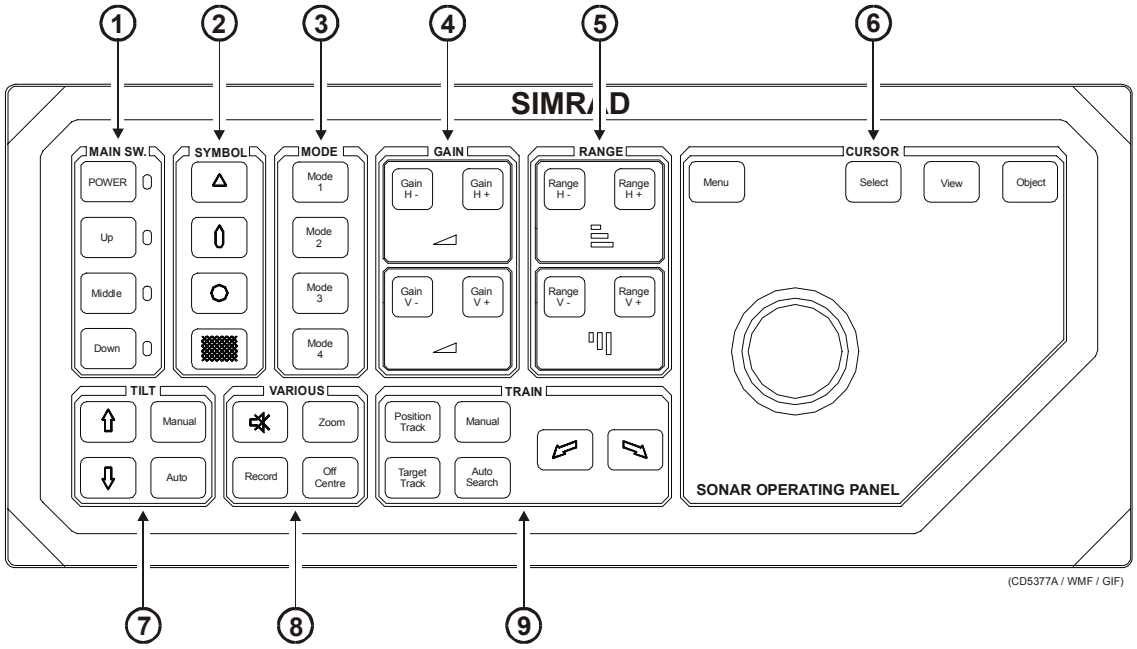


Figure 35 The Operating Panel

Functional test

Observe the following procedure to check a selection of the operational functions.

Markers

☐ **1** Check the **Target Marker**.

a Use the trackball on the Operating Panel, and move the cursor to the echo area.

b Press the **Target Marker** button (field 2, top button).

c Check that a numbered triangle appears in the position of the cursor.

☐ **2** Check the **Ship Marker**.

a Press the **Ship Marker** button (field 2, second button).

b Check if a square symbol appears at the ship's symbol.

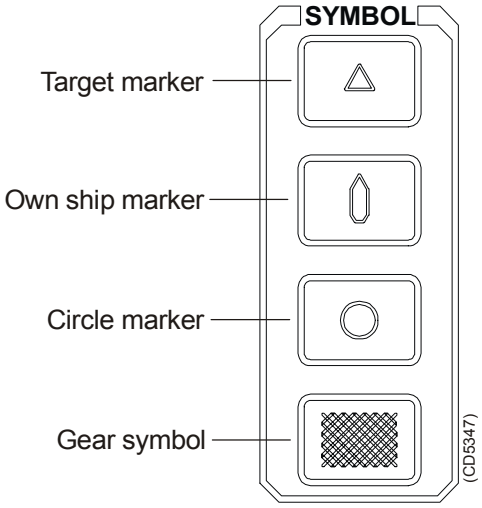


Figure 36 The Symbol field with the three markers and the Gear symbol

☐ **3** Remove **Target Marker** and **Ship Marker**.

a Use the trackball to move the cursor to the **Objects** tab on the right-hand side of the menu.

b Press the **Select** button.

c Press the **Delete All** button.

d Check that both the **Target Marker** and the **Ship Marker** disappear.

☐ **4** Check the **Circle Marker**.

a Press the **Circle Marker** button (field 2, third button).

b Check if a circle appears centred around the cursor.

c Press the button once more, and check that the circle marker disappears.

☐ **5** Check the **Seine circle**.

a Press the **Gear button** (field 2, bottom button).

b Check that a **Seine circle** appears next to the ship symbol.

c Press again to bring up the Ship Marker at the ship symbol.

d Press a third time to remove the **Seine circle**.

Modes

☐ **6** Press the four **Mode** buttons (field 3) and check that different display modes are selected.

Horizontal gain and range

☐ **7** Check the **Horizontal gain** readouts.

a Select **Mode 2** (270/Vertical).

b Press the **Horizontal** tab to bring up this menu.

c Press the **Gain H-** and **Gain H+** buttons repeatedly (field 4 on the Operating Panel).

d Check that the **Gain** readout in the menu and on the top of the tilt indicator changes from 0 to 50.

☐ **8** Check the **Horizontal range** readout.

a Press the **Range H-** and **Range H+** buttons repeatedly (field 5 on the Operating Panel)

b Check that the **Range** readout in the menu and on the top of the tilt indicator changes accordingly.

Vertical gain and range

☐ **9** Check the **Vertical gain** readout.

a Press the **Vertical** tab to bring up this menu.

b Press the **Gain V-** and **Gain V+** buttons repeatedly (field 4 on the Operating Panel).

c Check that the **Gain** readout in vertical the menu can be changed from 0 to 50.

☐ **10** Check the **Vertical range** readout.

a Press the **Range V-** and **Range V+** buttons repeatedly.

b Check that the **Range** readout in the **Vertical** menu changes corresponding the horizontal ranges.

Full screen

☐ **11** Check the **Full screen** function.

a Press the **Menu** button (field 6, left button)

b Check that the menu disappears for a Full Screen echo presentation.

c Press the button once again to recall the menu.

View menu

☐ **12** Check the **View** menu.

a Move the cursor to any position inside the echo area.

b Press the **View** button (field 6).

c Check that the **View** menu appears. (Note that this menu must be regarded as an object menu, and it appears next to the cursor in the echo field.)

d Press the **Select** button again to remove the menu.

Object menu

☐ **13** Check the **Object** menu.

- **a** Move the cursor to a new position inside the echo area.
- **b** Press the **Object** button (field 6).
- **c** Check that an **Object** menu appears. (Note thas this menu appears next to the cursor in the echo field.)
- **d** Press the **Select** button again to remove the menu.

Manual and automatic tilt

☐ **14** Check the **Tilt** readout.

- **a** Select the **Horizontal** menu.
- **b** Press the **Tilt Up/Down** buttons (field 7) repeatedly.
- **c** Check that the tilt readout in the menu corresponds with the **Tilt indicator** shown in the top left corner of the display.
- **d** Press the **Auto** button.
- **e** Check that the tilt limits appear on the **Tilt indicator**.
- **f** Press **Manual** to stop the automatic tilt program.

Zoom view

☐ **15** Check the **Zoom** function.

- **a** Select **Mode 1** (Bow Up).
- **b** Move the cursor to an echo, and press the **Zoom** button (field 8).
- **c** Check that the echo is zoomed up.
- **d** Press the **Zoom** button again.
- **e** Check that the echo is brought back to its normal size.

Off centre

☐ **16** Check the **Off centre** function.

- **a** Move the cursor to any position inside the echo area.
- **b** Press the **Off Centre** button (field 8).
- **c** Check that the ship's symbol changes its position to where the cursor is.
- **d** Select **Mode 2** and then **Mode 1** to move the ship symbol back to the screen centre.

Training

☐ **17** Check the **Training** function.

- **a** Press the left and right **Manual train** buttons repeatedly (field 9, right two buttons).

b Check that the white audio line on the screen trains correspondingly.

c Try both directions.

☐ **18** Check the **Position Track** function.

a Move the cursor to any position on the screen.

b Press the **Position Track** button (field 9).

c Check that a circle appears at the cursor, and that the audio line moves to the circle.

☐ **19** Check the **Target Track** function.

a Move the cursor to an echo.

b Press the **Target Track** button (field 9).

c Check that a violet circle appears at the cursor, and that the audio line moves to the circle.

☐ **20** Check the **Manual train** function.

a Press the **Manual** training button (field 9).

b Check that the violet circle disappears.

☐ **21** Check the **Auto search** function.

a Press the **Auto Search** button (field 9).

b Check that the audio line starts a search within the displayed sector limits.

c Press the **Manual** button to stop the search.

Operating Panel backlight

☐ **22** Check the Operating Panel backlight.

a Select the **Display** menu.

b Press the left and right hand side of the **Panel Backlight** menu button.

c Check that the Operating Panel backlight can be decreased and increased.

Power off

Observe the following procedure to switch off the sonar for the remaining tests.

☐ **1** Select the **Horizontal** menu.

☐ **2** Set the **TX Power** button to **Off**.

☐ **3** Press the **Power** button on the Operating Panel for approximately three seconds to switch off the sonar.

☐ **4** Check that the green LED next to the button extinguish, and that the sonar picture changes for the power off sequence.

9.7 Checking the hoisting/lower system

Introduction

The following set of procedures requires two persons. One person must be stationed on the bridge to operate the sonar, while one must stay in the sonar room to make sure the hoisting/lowering system works properly.

Proper communication exists between the two locations is useful.

Note

*Should any problems arise during the operation, the person in the sonar room must press the red button marked **0** on the motor overload switch **S301** in the Motor Control Unit.*

→ *Refer to figure 31 on page 92.*

The following two procedures must be performed simultanously by the person on the bridge and the person in the sonar room.

- *Checking the bridge functions* shall be performed on the bridge
- *Checking the sonar room functions* shall be performed in the sonar room.

To simplify the test, remove the applicable pages from this manual.

Preparations

Prior to the two main test procedures, observe the following preparations.

☐ **1** Connect cable **C15** from the Transceiver Unit to the Sonar Interface Unit.

Checking the bridge functions

Note

This procedure must be performed simultanously with the next procedure; Checking the sonar room functions.

The instructions marked **Sonar room:** are performed in the sonar room.

- ☐ **1** Check that the depth under the keel is sufficient to safely lower the transducer.
- ☐ **2** Start the sonar.
  - **a** Press the **Power** button on the Sonar Operating Panel for approximately two seconds.
  - **b** Check that the green LED next to the **Power** button starts blinking.
  - **c** Observe that the sonar picture is displayed after approximately two minutes.
  - **d** Check that the green LED next to the **Up** button illuminates.
  - **e** Check that the upper button in the **Status** menu shows **Transducer: UP.**
  - **f** If communication exists, notify the sonar room to perform the next step.
- **3** **Sonar room:** Press the black button marked **1** on the motor overload switch **S301** in the Motor Control Unit.
- **4** **Sonar room:** Set the hoist / lower switch **S302** in the Motor Control Unit to **Remote.**
- ☐ **5** Lower the transducer to its middle position.
  - **a** Press the **Middle** button in the **Main Sw** field on the Operating Panel to lower the transducer to its middle position.
  - **b** Check that the LED next to the **Middle** button starts to flash, and that the audible signal indicates transducer movement.
  - **c** When middle position has been reached, check that the LED next to the **Middle** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows **Transducer: MIDDLE**.
- ☐ **6** Lower the transducer to its lower position.
  - **a** Press the **Down** button to lower the transducer to the lower position.
  - **b** Check that the LED next to the **Down** button starts to flash, and that the audible signal indicates transducer movement.

c When lower position has been reached, check that the LED next to the **Down** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows **Transducer: DOWN**.

☐ **7** Hoist the transducer to its middle position.

a Press the **Middle** button to hoist the transducer to the middle position.

b Check that the LED next to the **Middle** button starts to flash, and that the audible signal indicates transducer movement.

c When middle position has been reached, check that the LED next to the **Middle** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows **Transducer: MIDDLE**.

☐ **8** Hoist the transducer to its upper position.

a Press the **Up** button to hoist the transducer to the upper position.

b Check that the LED next to the **Up** button starts to flash, and that the audible signal indicates transducer movement.

c When upper position has been reached, check that the LED next to the **Up** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows **Transducer: UP**.

☐ **9** Lower the transducer to its lower position.

a Press the **Down** button to lower the transducer to the lower position.

b Check that the LED next to the **Down** button starts to flash, and that the audible signal indicates transducer movement.

c When lower position has been reached, check that the LED next to the **Down** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows **Transducer: DOWN**.

☐ **10** Hoist the transducer to its upper position.

a Press the **Up** button to hoist the transducer to the upper position.

b Check that the LED next to the **Up** button starts to flash, and that the audible signal indicates transducer movement.

c When upper position has been reached, check that the LED next to the **Up** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows **Transducer: UP**.

d Notify the sonar room to perform the next step.

11 **Sonar room:** Set the hoisting/lowering switch **S302** in the Motor Control unit to the **Stop** position.

☐ **12** Switch off the sonar.

a Press the **Power** button on the Operating Panel for approximately three seconds.

b Check if the green LED next to the button extinguish, and that the sonar picture is changed to present the power off sequence.

c Notify the sonar room that the test is finished.

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Checking the sonar room functions

Note

This procedure must be performed simultanously with the procedure and checklist in the previous chapter; Checking the bridge functions.

The instructions marked **Bridge:** are performed on the bridge. Note that these procedures are more detailed that what is presented here.

☐ **1** Check that the depth under the keel is sufficient to safely lower the transducer.

2 **Bridge:** Start the sonar.

☐ **3** Press the black button marked **1** on the motor overload switch **S301** in the Motor Control Unit.

☐ **4** Set the hoist / lower switch **S302** in the Motor Control Unit to **Remote.**

a Notify the bridge to perform the next step.

5 **Bridge:** Lower the transducer to its middle position.

6 **Bridge:** Lower the transducer to is lower position.

7 **Bridge:** Hoist the transducer to its middle position.

8 **Bridge:** Hoist the transducer to its upper position.

9 **Bridge:** Lower the transducer to is lower position.

10 **Bridge:** Hoist the transducer to its upper position.

☐ **11** Set the hoisting/lowering switch **S302** in the Motor Control unit to the **Stop** position.

a Notify the bridge to perform the next step.

12 **Bridge:** Switch off the sonar.

9.8 Starting up the Transceiver Unit

Observe this test procedure to power up the Transceiver Unit for the first time.

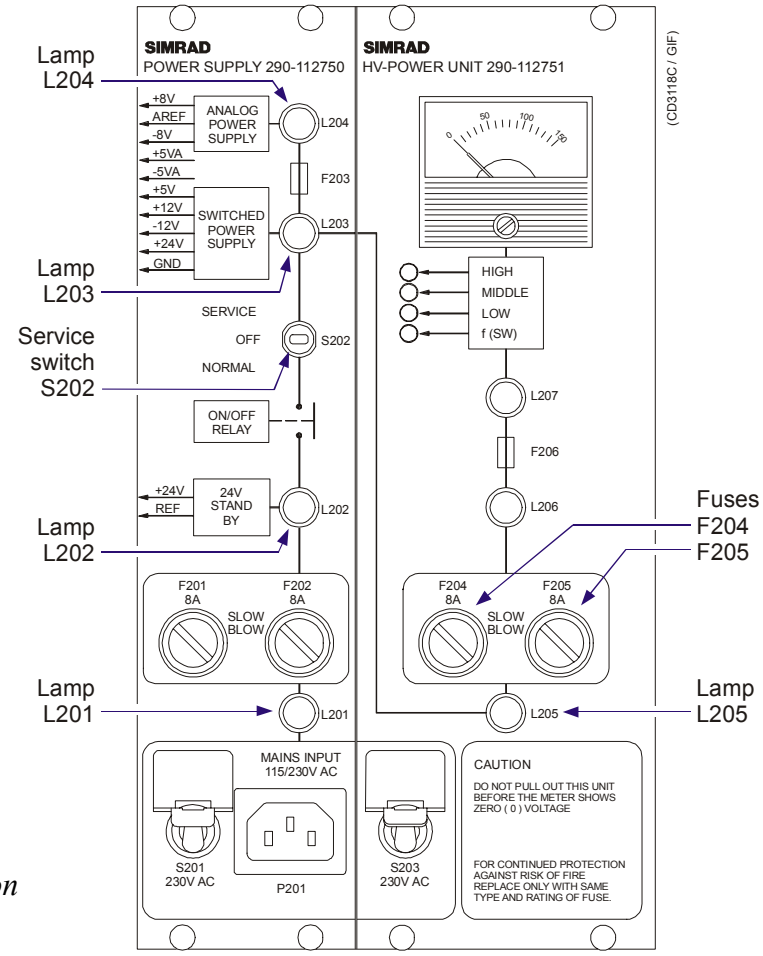

Figure 37 The lamps, fuses and service switch on the power supplies

- ☐ **1** Remove the fuses **F204** and **F205** from the HV Power unit's front panel.
- ☐ **2** Set the service switch **S202** on the power supply to **Service** position to start up the Transceiver Unit.
- ☐ **3** Check that the fans start, and that the lamps **L201**, **L202**, **L203** and **L204** on the power supply are lit.
- ☐ **4** Check that only lamp **L205** on the HV power unit is lit.
- ☐ **5** Check that the following small LEDs on the Transceiver Interface Board (TIB) illuminate (refer to the indication on the front of the power supply):
  - +8 V, -8 V, +5VA, -5 AV, +5 V, +12 V, +24 V and +24 V stand-by.
- ☐ **6** Switch off the Transceiver Unit by setting the service switch **S202** on the power supply to the **Normal** position.

☐ **7** Start up the sonar in the wheelhouse by pressing the **Power** button on the Operating Panel for approximately two seconds.

☐ **8** Check that the Transceiver Unit starts up after approximately two minutes, and the two LEDs marked **COM** on the top of the **SPB-31** circuit board starts to flash.

→ *The COM and TXEN. LEDs are shown on figure 38 on page 114.*

☐ **9** Switch off the sonar, and check that the Transceiver Unit is switched off as well.

9.9 Self-noise test

This test procedure will allow you to check the system's self-noise.

Observe the following procedure to prepare for the self-noise test.

☐ **1** Start up the sonar.

☐ **2** Select the following parameters in the menu system to execute a self-noise test of the sonar installation.

a Select the **Setup** menu.

b Locate the **Test...** button, and press it to bring up the **System Test** menu.

c Press the **Test Config** button to access the **Test Config** submenu in the lower part of the menu field.

d Select **Noise & VR** to select the **Noise test** menu settings.

- After the preparations described above has been carried out, the echo level for the selected audio beam will be displayed in the **Echo Level** button in the **System Test** menu.

☐ **3** If noise is shown on the display, turn the white audio line with one of the two manual training buttons to the noisy area on the display.

- The buttons in question are the two buttons on the right-hand side of the **Train** field on the Operator Panel.

☐ **4** Read off the echo level (from the menu button).

- Write down the measured echo level here. You should expect the value to be 43 dB ±3 dB

Echo level (dB):	

☐ **5** Switch off the sonar.

9.10 System start-up

Introduction

To do the final tests, the vessel must be in the sea. This is because the transducer always must be in water before you start transmitting.

WARNING **If the sonar system starts transmitting while the transducer array is in open air, this may lead to serious damage to the transducer and the transmitters.**

Preparations

In order to prepare the system start-up, carry out the following operations in the Transceiver Unit and the motor control unit.

☐ **1** Connect and fasten the transducer plug to the left-hand side of the Transceiver Unit.

- Use the screws and washers applied for the protecting cover.

☐ **2** Reinsert the fuses **F204** and **F205** on the HV power unit.

→ *The fuses are shown on figure 37 on page 110.*

☐ **3** Set the hoisting/lowering switch **S302** in the Motor Control Unit to **Remote** position.

Starting up the transmitter

The following set of procedures requires two persons. One person must be stationed on the bridge to operate the sonar, while one must stay in the sonar room to make sure the Transceiver Unit works properly.

Make sure that proper communication exists between the two locations.

Note

*Should problems occur in the sonar room, the person in the sonar room must set the service switch **S202** to **Off.***

The following two procedures must be performed simultanously by the person on the bridge and the person in the sonar room.

To simplify the test, remove the applicable pages from this manual.

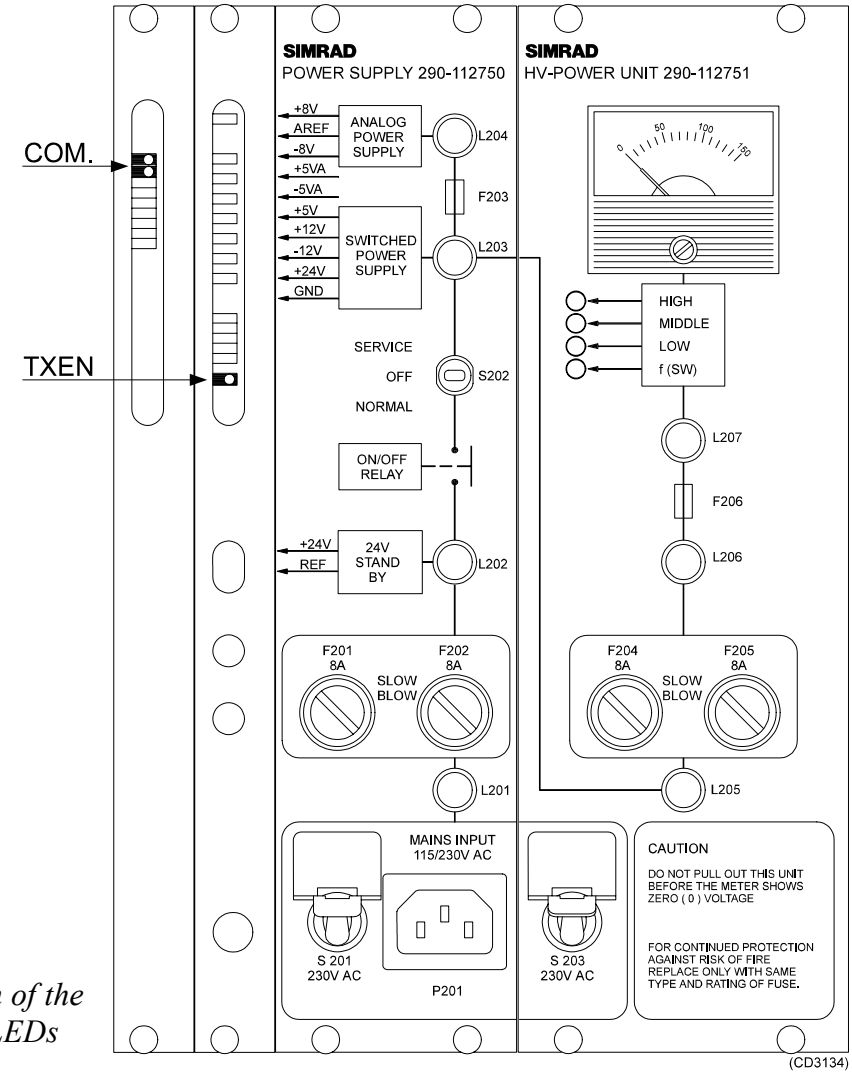

Figure 38 Location of the COM and TXEN LEDs

Actions on the bridge

Note

This procedure must be performed simultanously with the next procedure; Actions in the sonar room.

The instructions marked **Sonar room** are performed in the sonar room.

- ☐ **1** Start up the sonar.
- ☐ **2** Check that the depth is sufficient for lowering of the transducer.
- ☐ **3** Lower the transducer to middle position by giving a short press on the **Middle** button.
- ☐ **4** Set the **TX Power** in the **Horizontal** menu to **Low**, and check that echoes appear on the display.
- **5** **Sonar room:** Check that the voltmeter on the HV Power unit shows approximately 25 V.
- **6** **Sonar room:** Check that the **TX Enable** LED (TXEN) on the TIB board starts flashing.

  → *For location of the TXEN LED, refer to figure 38 on page 114.*

- ☐ **7** Set the **TX Power** in the main menu to **Medium**, and check that the echoes become stronger.
- **8** **Sonar room:** Check that the voltmeter on the HV Power unit shows approximately 50 V.
- ☐ **9** Set the **TX Power** in the **Horizontal** menu to **Full**, and check that the echoes become even stronger.
- **10** **Sonar room:** Check that the voltmeter on the HV Power unit shows approximately 100 V.

If the Hull Unit is installed differently from the recommended orientation, the echo picture on the display must be aligned to show the echoes in correct position.

→ *Refer to* Alignment of the sonar picture *on page 118.*

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Actions in the sonar room

Note

This procedure must be performed simultanously with the previous procedure; Actions on the bridge.

The instructions marked **Bridge** are performed on the bridge.

1 **Bridge:** Start up the sonar.

2 **Bridge:** Check that the depth is sufficient for lower the transducer

3 **Bridge:** Lower the transducer to middle position by giving a short press on the middle button.

4 **Bridge:** Set the **TX Power** in the **Horizontal** menu to **Low** and check that echoes appear on the display.

☐ **5** Check that the voltmeter on the HV Power unit shows approximately 25 V.

☐ **6** Check that the **TX Enable** LED (TXEN) on the TIB board starts flashing.

→ *For location of the TXEN LED, refer to figure 38 on page 114.*

7 **Bridge:** Set the **TX Power** in the **Horizontal** menu to **Medium**, and check that the echoes become stronger.

☐ **8** Check that the voltmeter on the HV Power unit shows approximately 50 V.

9 **Bridge:** Set the **TX Power** in the **Horizontal** menu to **Full**, and check that the echoes become even stronger.

☐ **10** Check that the voltmeter on the HV Power unit shows approximately 100 V.

9.11 Alignment of the sonar picture

Independent of the hull unit orientation, the alignment is always defined as:

- the angle measured clockwise from the bow to the 0 degrees transducer mark.

The 0 degrees transducer mark is located outermost on the mounting flange, and it is marked as a red “0”.

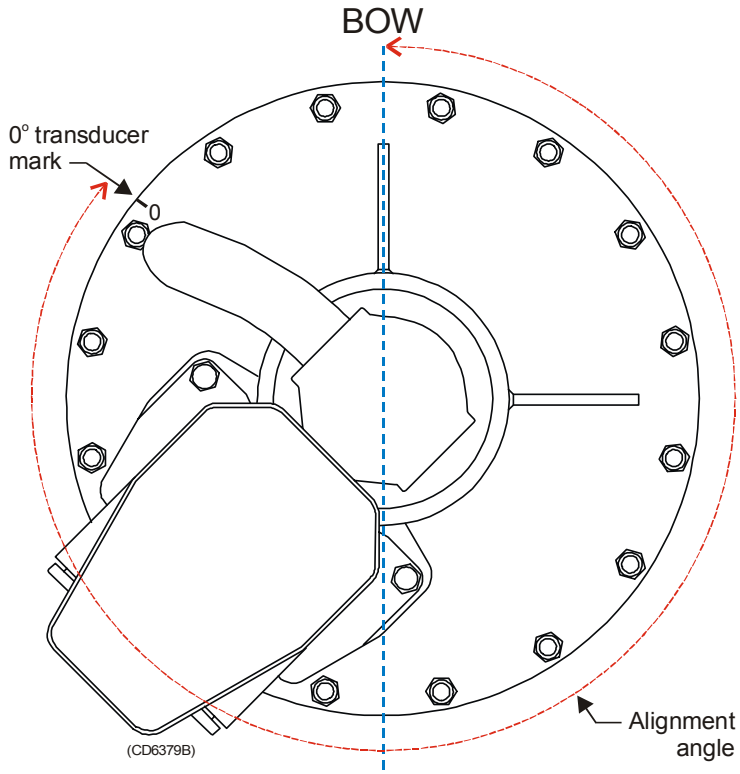


Figure 39 Definition of the alignment angle

Observe the following procedure to align the sonar picture.

☐ **1** Locate the 0 degrees transducer mark.

☐ **2** Estimate the approximate alignment angle (0 to 360 degrees) clockwise from the bow to the 0 degrees transducer mark.

- The 22.5 degrees angle between each mounting bolt can be used as an aid.

☐ **3** Turn the echo picture on the display in the following way:

a Select the **Setup** menu.

b Press the **Test...** to bring up the **System test** menu.

c Press the **Installation Menu** button, and observe the menu appears on the top of the display.

d Select **Installation** on the **Installation menu**, and then **Alignment**.

e Observe the **Sonar transceiver configuration** menu appear at the bottom of the menu field.

f Press the **Alignment** button.

g Enter the estimated alignment angle.

☐ **4** Check that the echo picture on the display is correct in relation to the ambient situation.

- If not, make a fine adjustment of the alignment.

In order to make a correct alignment, a particular target such as a buoy is required. When the alignment is correct, write the angle here.

Alignment correction (degrees):	

9.12 Adjusting the stabilisation sensor offset

Independent of the hull unit orientation, the offset of the stabilization sensor is always defined as:

- the angle measured clockwise from the 0 degrees transducer mark to the 0 degrees reference for the stabilization sensor.

The 0 degrees transducer mark is located outermost on the mounting flange. The 0 degrees reference for the stabilization sensor is always related to the gantry, as indicated in the figure below.

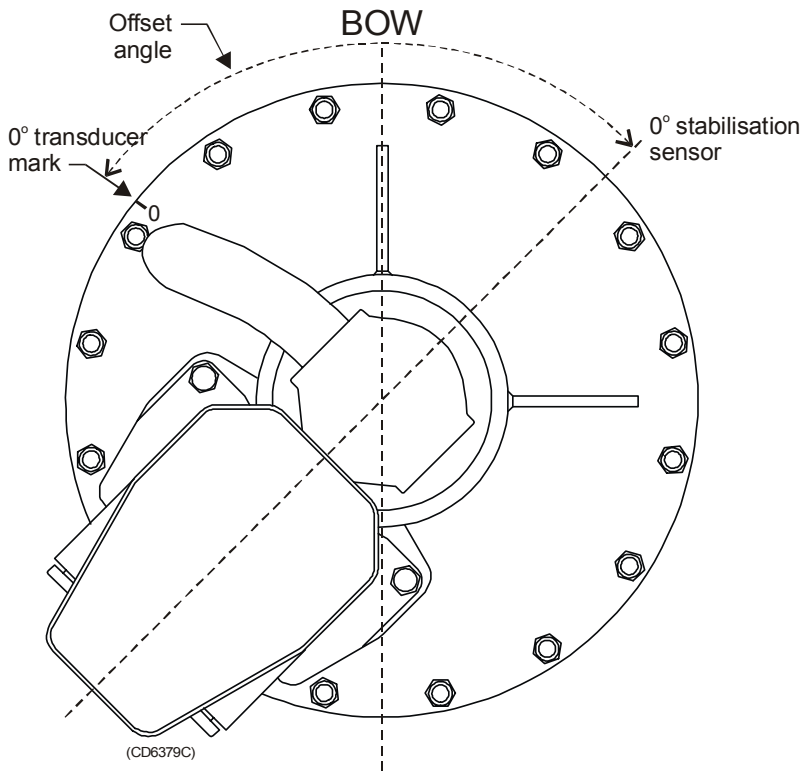


Figure 40 Offset angle definition

Procedure: To estimate the offset angle

Observe the following procedure to estimate the offset of the stabilization sensor.

☐ **5** Locate the 0 degrees transducer mark.

☐ **6** Estimate the approximate offset angle (0 to 360 degrees) clockwise from the 0 degrees transducer mark to the 0 degrees reference stabilization mark.

- The 22.5 degrees angle between each mounting bolt can be used as an aid.

☐ **7** Record the estimated offset angle.

Stabilization offset (degrees):	

Procedure: To enter the stabilisation offset angle

Observe the following procedure to enter the offset stabilization angle as a parameter into the sonar system.

1 Select the **Setup** menu

2 Press the **Test...** to bring up the **System test** menu.

3 Press the **Installation Menu** button, and observe the menu appears on the top of the display.

4 Select **Installation** on the **Installation menu**, and then **Alignment**.

5 Observe the **Sonar transceiver configuration** menu appear at the bottom of the menu field.

6 Press the **Offset** button.

☐ **7** Enter the estimated offset angle.

9.13 Setting own ship parameters

Ship dimensions

To get the correct size of the vessel symbol on the display, the length and width have to be adjusted in the following way:

1 Select the **Setup** menu.

2 Press the **Test...** button to bring up the **System test** menu.

3 Press the **Installation Menu** button, and observe the menu appear on the top of the display.

4 Select **Own Ship** on the **Installation menu**, and then **Ship Dimensions.**

5 Observe the **Ship Dimensions** menu appear in the bottom of the menu field.

6 Press the **Ship Length** button, and enter the appropriate value.

7 Press the **Ship Witdh** button, and enter the appropriate value.

8 Press **Close** to finish.

When a new display mode is selected, the vessel symbol will change to the selected size.

Instrument position offsets

In order to get correct references of the instruments, the position of the sonar transducer and the GPS antenna must be set relative to the origo definition.

→ *Refer to figure 41 on page 123.*

The origo is initially positioned at the ship's stern. This is necessary to get the **Own ship** and **Seine** markers positioned on the ship's track line, which is generated from the ship's stern

Observe the following procedure for transducer and GPS antenna positioning.

1 Ensure that the **Installation menu** is visible at the top of the sonar display.
- If not, refer to the first procedure in this chapter.

2 Select **Own Ship** on the Installation menu, then **Instrument Position Offsets**, and finally **Transducer.**

3 Observe the **Instrument Offset Positions** menu appear at the bottom of the menu field.

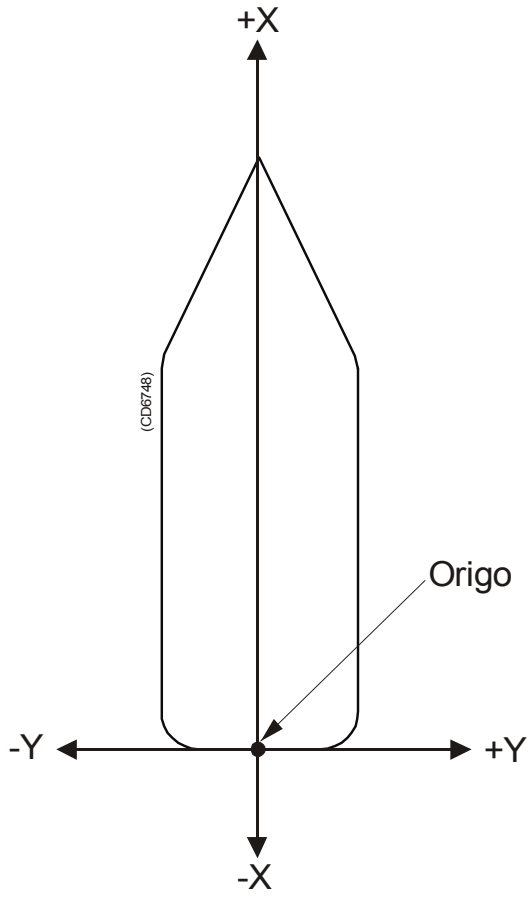


Figure 41 Origo definition

4 Press the **X Position** button and enter the correct value.

5 Press the **Y Position** button and enter the correct value.

6 Press **Close** to finish.

7 Select **Own Ship** on the Installation menu, then **Instrument Position Offsets**, and finally **GPS**.

8 Observe the **Instrument Offset Positions** menu appear at the bottom of the menu field.

9 Press the **X Position** button and enter the correct value.

10 Press the **Y Position** button and enter the correct value.

11 Press **Close** to finish.

When a new display mode is selected, the instruments will change to the chosen positions.

10 TESTING THE PERIPHERAL EQUIPMENT

10.1 Introduction

The physical connections of the peripehral sensors has been previously described. This chapter describes how the sonar system shall be set up to accept the signals from the sensors.

The following information is provided.

→ *General information, page 125.*

→ *Speed log, page 128.*

→ *Course gyro, page 130.*

→ *(D)GPS, page 132.*

→ *Echo sounder, page 133.*

→ *Trawl system, page 134.*

→ *Purse seine system, page 135.*

→ *Radio buoy system, page 136.*

→ *Current meter system, page 137.*

The physical connections of the peripherals are described in the chapter *Peripheral equipment*.

→ *Refer to page 75.*

10.2 General

Default interface settings

The sensor settings are all preset to these recommended connections.

Sensor	Type	Port	Baudrate	Talker
Trawl system	ITI	6	4800	None
	FS	6	4800	None
Echo sounder	NMEA	5	4800	None
Purse seine system	PI30	6	4800	None
Position system	GPS	4	4800	None
Speed log	SpeedLog	9	9600	SS
Heading	Gyro	3	4800	None
Hull unit				
Stabilization				
Weather	Wind		4800	None

Changing the interface settings

To change any of the interface settings, observe the following procedure.

1 Select the **Setup** menu.

2 Press the **Test...** button to open the **System Test** menu.

3 Press the **Installation Menu** button.

4 Observe the **Installation menu** appear on the top of the display.

5 Select **I/O Setup** on the **Installation menu**, and then **Sensors**.

6 Observe a submenu listing all the available sensors.

7 Move the cursor down on the submenu, but do not press the **Select** button on the Operating Panel.

8 Observe that each sensor has a new submenu listing the default choices or **None**. The chosen setting is marked.

9 Select **None** if you wish to disable the sensor input.

10 Select any of the other settings if you wish to define the sensor interface parameters.

11 Observe the **Sensor Config** submenu appear at the bottom of the menu field.

12 Make the appropriate settings for the sensor.

13 Press **Close** to finish.

If you enter a wrong value and the sensor interface does not work, you can change the parameters settings as many times as you wish. The final settings you make are automatically saved when the sonar system is switched off.

Serial line inspection

The Processor Unit contains an **Object Inspector**, where it is possible to read the data of the connected serial line. This is a valuable tool to check if the connections to the serial line are working, and for checking the telegram format of the received data.

Use the following procedure for viewing of the Object Inspector:

1 Select the **Setup** menu.

2 Presse **Test...** button to open the **System test** menu.

3 Press the **Message Bar** button, and observe the Message Bar submenu appears ath the bottom of the menu field.

4 Select **Always on** in the submenu.

- Observe the appearance of a small horizontal bar at the bottom of the display. On the right hand side of the bar, a few buttons display the number of warnings, errors and alarms that are given.

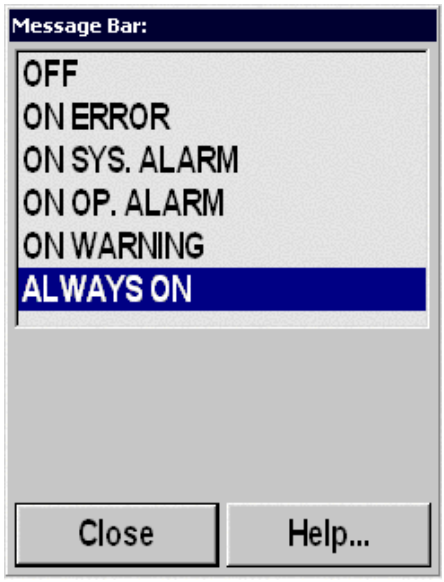


Figure 42 The Message Bar submenu at the bottom of the menu field

5 Double-click on the message bar line.with the **Object** button on the Operator Panel, or with right mouse button.

6 Observe the **Object Inspector** appears.

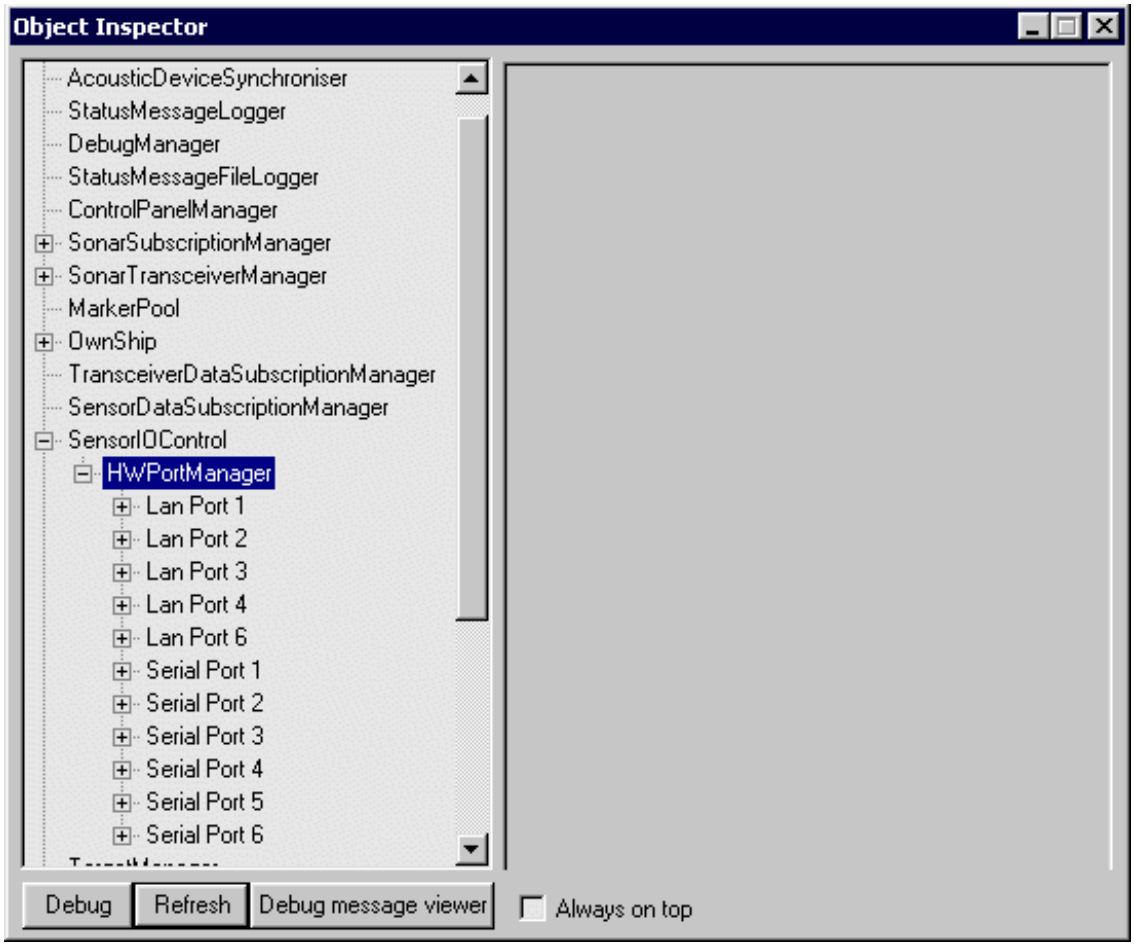


Figure 43 The Object Inspector

7 Select **SensorIOControl** on the list by pressing on the + sign in front of the title, and then **HWPortManager** in the same way.

8 Observe the list of communication ports.

9 Press the + sign in front of the actual serial port.

10 Press the COM symbol under the serial port.

The Object Inspector will display the transmit and receive data currently handled by the selected communication port.

If you select **Always on top**, you can make changes in the menu without removing the **Object Inspector** dialogue box.

10.3 Speed log

Introduction

The speed log can come from three different sensor types. Tick off for the type which will be connected.

- ☐ • Pulse log (200 pulses/nm)
- ☐ • Speed log (RS-232 serial line)
- ☐ • (D)GPS

Refer to the selected speed log source in the following text.

Pulse log (200 pulses per nautical mile)

The pulse log input shall be connected to terminal **TB8** inside the Sonar Interface Unit.

Observe the following procedure to test the pulse log input:

☐ **1** Access the **I/O Setup** menu.

☐ **2** Select **Sensors** in the **I/O Setup** menu, then **Speed** and finally **Speed Log**.

☐ **3** Check that the settings in the **Sensor Config** menu correspond to the sensor settings table. Note that the pulse log must use serial port no.9.

☐ **4** Press **Close** to exit the **Sensor Config** menu.

☐ **5** Check that the speed readout in the **Status** menu corresponds to the vessel's speed log.

The pulse log connection and interface circuit is located in the Sonar Interface Unit.

An oscilloscope can be connected to the test point **TP33** to check if the pulse log signal is present through the comparator IC30 (**TP34** is GND). If not, try to adjust the potentiometer R64. In case of noise problems, R64 can be adjusted for noise limitation.

Related topics

→ *Location of TB8, page 76.*

→ *Access to the I/O Setup, page 125.*

→ *Sensor settings table, page 125.*

→ *Pulse log interface, page 77.*

Speed log with RS-232 serial line

Observe the following procedure to test the speed log input:

- [ ] **1** Access the **I/O Setup** menu.
- [ ] **2** Select **Sensors** in the **I/O Setup** menu, then **Speed** and finally **Speed Log**.
- [ ] **3** Observe the **Sensor Config** submenu appears at the bottom of the menu field.
- [ ] **4** Change the settings in the **Sensor Config** submenu to suit your requirements for the serial line.
  - Remember to set correct baud rate, and set **Talker** to **None**.
- [ ] **5** Press **Close** to exit the **Sensor Config** menu.
- [ ] **6** Check that the speed readout in the **Status** menu corresponds to the vessel's speed log.

Related topics

→ *Access to the I/O Setup, page 125.*

Speed data from (D)GPS

If the GPS is used for the speed data input, wait with this test until the GPS position data are tested.

Observe the following procedure to test the GPS speed input:

- [ ] **1** Access the **I/O Setup** menu.
- [ ] **2** Select **Sensors** in the **I/O Setup** menu, then **Speed** and finally **Speed Log**.
- [ ] **3** Observe the **Sensor Config** submenu appears at the bottom of the menu field.
- [ ] **4** Change the settings in the **Sensor Config** submenu to suit your requirements for the serial line.
  - Remember to set correct baud rate, and set **Talker** to **GP**.
- [ ] **5** Press **Close** to exit the **Sensor Config** menu.
- [ ] **6** Check that the speed readout in the **Status** menu corresponds to the GPS speed.

Related topics

→ *Access to the I/O Setup, page 125.*

10.4 Course gyro

Introduction

The heading can come from two different sensor types. Tick off for the type which will be connected.

- ☐ Course gyro
- ☐ (D)GPS

Note that the heading information from a GPS is generally too inconsistent to provide a stable sonar presentation.

Refer to the selected heading source in the following text.

Course gyro

The Processor Unit can read the heading information from a RS-232 serial line. If only a 3-phase synchro or stepper signal is available, an optional gyro interface unit must be used for converting these signals to RS-232 serial line format.

Observe the following procedure to test the course gyro input:

☐ **1** Access the **I/O Setup** menu.

☐ **2** Select **Sensors** in the **I/O Setup** menu, then **Heading** and finally **Gyro**.

☐ **3** Observe the **Sensor Config** submenu appears at the bottom of the menu field.

☐ **4** Change the settings in the **Sensor Config** submenu to suit your requirements for the serial line.

☐ **5** Press **Close** to exit the **Sensor Config** menu.

☐ **6** Check that the heading readout in the **Status** menu corresponds to the vessel's course gyro.

Related topics

→ *Course gyro information, page 6.*

→ *I/O Setup procedure, page 125.*

Heading data from (D)GPS

If the GPS is used for the course gyro input, wait with this test until the GPS position data are tested.

Use the following procedure for testing the GPS input:

☐ **1** Access the **I/O Setup** menu.

☐ **2** Select **Sensors** in the **I/O Setup** menu, then **Heading** and finally **Gyro**.

- [ ] **3** Observe the **Sensor Config** submenu appears at the bottom of the menu field.
- [ ] **4** Change the settings in the **Sensor Config** submenu to suit your requirements for the serial line.
- [ ] **5** Press **Close** to exit the **Sensor Config** menu.
- [ ] **6** Check that the heading readout in the **Status** menu corresponds to the GPS heading.

Related topics

→ *I/O Setup procedure, page 125.*

10.5 (D)GPS

Observe the following procedure to test the GPS input:

- ☐ **1** Access the **I/O Setup** menu.
  → *A procedure for this is located on page 125.*
- ☐ **2** Select **Sensors** in the **I/O Setup** menu, then **Pos.System**, and finally **GPS**.
- ☐ **3** Observe the **Sensor Config** submenu appears at the bottom of the menu field.
- ☐ **4** Check that the settings in the **Sensor Config** submenu corresponds to your requirements for the serial line.
- ☐ **5** Press **Close** to exit the **Sensor Config** menu.
- ☐ **6** Check that the Lat/Long readout in the **Status** menu corresponds to the GPS readout.

10.6 Echo sounder

The SP60 Processor Unit can read the depth information from an echo sounder on standard NMEA 0183 RS-232 serial line format.

Observe the following procedure to test the echo sounder interface.

- ☐ **1** Access the **I/O Setup** menu.

  → *A procedure for this is located on page 125.*

- ☐ **2** Select **Sensors** in the **I/O Setup** menu, then **Echo sounder**, and finally **EchoNmea**
- ☐ **3** Observe the **Sensor Config** submenu appears at the bottom of the menu field.
- ☐ **4** Check that the settings in the **Sensor Config** submenu correspond to your requirements for the serial line.
- ☐ **5** Press **Close** to exit the **Sensor Config** menu.
- ☐ **6** Select **Bow up/Vertical** mode.
- ☐ **7** Check that the depth readout in the **Catch Data** page corresponds to the depth readout on the echo sounder.

10.7 Trawl system

Observe the following procedure to test the trawl system interface.

☐ **1** Access the **I/O Setup** menu.

→ *A procedure for this is located on page 125.*

☐ **2** Select **Sensors** in the **I/O Setup** menu, then **Trawl System**, and finally **ITI** or **FS3300**.

- Select ITI or FS3300 depending on the system you have installed on your vessel.

☐ **3** Observe the **Sensor Config** submenu appears at the bottom of the menu field.

☐ **4** Check that the settings in the **Sensor Config** submenu correspond to your requirements for the serial line.

☐ **5** Press **Close** to exit the **Sensor Config** menu.

☐ **6** Check the trawl readouts as follows:

a Select the **Setup** menu.

b Press the **Gear** button to access the **Gear** submenu at the bottom of the menu field.

c Select either of the **Bottom Trawl** or **Pelagic Trawl** settings.

d Press the **Edit** button to access the **Trawl Configuration** submenu

e Check that the different readouts in the submenu corresponds to those from the connected trawl system.

10.8 Purse seine system

Observe the following procedure to test the purse seine interface.

☐ **1** Access the **I/O Setup** menu.

→ *A procedure for this is located on page 125.*

☐ **2** Select **Sensors** in the **I/O Setup** menu, then **Seine System**, and finally **ITI** or **PI30**.

- Select ITI or PI30 depending on the system you have installed on your vessel.

☐ **3** Observe the **Sensor Config** submenu appears at the bottom of the menu field.

☐ **4** Check that the settings in the **Sensor Config** submenu correspond to your requirements for the serial line.

☐ **5** Press **Close** to exit the **Sensor Config** menu.

☐ **6** Check the purse seine system readouts as follows:

a Select the **Setup** menu.

b Press the **Gear** button to access the **Gear** submenu at the bottom of the menu field.

c Select either of the **Purse** settings.

d Press the **Edit** button to access the **Net Configuration** submenu

e Check that the different readouts in the submenu corresponds to those from the connected purse seine system.

10.9 Radio buoy system

Observe the following procedure to test the radio buoy system interface.

☐ **1** Access the **I/O Setup** menu.

→ *A procedure for this is located on page 125.*

☐ **2** Select **Sensors** in the **I/O Setup** menu, then **BuoySystem**, and finally **Buoy NMEA**.

☐ **3** Observe the **Sensor Config** submenu appears at the bottom of the menu field.

☐ **4** Check that the settings in the **Sensor Config** submenu correspond to your requirements for the serial line.

☐ **5** Press **Close** to exit the **Sensor Config** menu.

☐ **6** Select the **Objects** menu, and check that the Buoy readout (**F**) is shown.

☐ **7** Select one of the buoys in the **Objects** menu, and verify that the buoy data is shown in the dialogue below the menu.

10.10 Current meter system

Observe the following procedure to test the Current Meter system interface.

- [ ] **1** Access the **I/O Setup** menu.

  → *A procedure for this is located on page 125.*

- [ ] **2** Select **Sensors** in the **I/O Setup** menu, then **Current meter**, and finally **Kaijo.**

- [ ] **3** Observe the **Sensor Config** submenu appears at the bottom of the menu field.

- [ ] **4** Check that the settings in the **Sensor Config** submenu correspond to your requirements for the serial line.

- [ ] **5** Press **Close** to exit the **Sensor Config** menu.

- [ ] **6** Select the **Objects** menu, and check that the Buoy readout (**F**) is shown.

- [ ] **7** Select one of the buoys in the **Objects** menu, and verify that the buoy data is shown in the dialogue below the menu.

11 FINAL TESTS AND MEASUREMENTS

11.1 Introduction

In order to verify that the sonar works properly, the following measurements and tests must be carried out:

→ *Source Level (SL) measurements, page 139.*

→ *Receiving voltage response (VR), page 143.*

→ *Noise/speed curve, page 146.*

To make these tests and measurements, an oscilloscope, a signal generator and a test hydrophone must be available.

11.2 Source level (SL) measurements

Preparations

The procedure calls for a test hydrophone. Prior to use, fill in the technical specifications and the appropriate environmental specifications for the hydrophone to be used. Use the table provided.

→ *Refer to table 3*

Hydrophone data	Value	Unit	Example
Serial number		Serial No.	1823860
Date of calibration*		month/year	10/96
Calibrated at temperature		°C	18°
Sensitivity as transmitter S		dB//1μPa/V	119.2
Sensitivity as receiver M		dB//1V/μPa	-208.9
M extension cable (0.7/10m)		dB//1V/μPa	0.7
M total = M + M extension		dB//1V/μPa	-209.6

Table 3 Test hydrophone data

Finally, you need to hook up the test equipement.

→ *Refer to figure 44 for the necessary test schematics.*

Preparing the operational mode

For measurement of the source level in omni mode, use the following menu settings.

1 Select the **Setup** menu.

2 Press the **Test...** button to access up the **System Text** menu.

3 Press the **Test Config** button.

4 Observe the **Test Config** submenu appear in the bottom part of the menu field.

5 Select **Source Level**.

This command sequence has now automatically set up all the sonar parameters required to do the source level measurements.

Test procedure

Observe the following procedure to make the source level measurements.

☐ **1** Connect the hydrophone and **TX Enable** pulse to the oscilloscope as shown in the test schematics.

☐ **2** Ensure that the distance between the transducer and the hydrophone is between 5 and 10 meters.

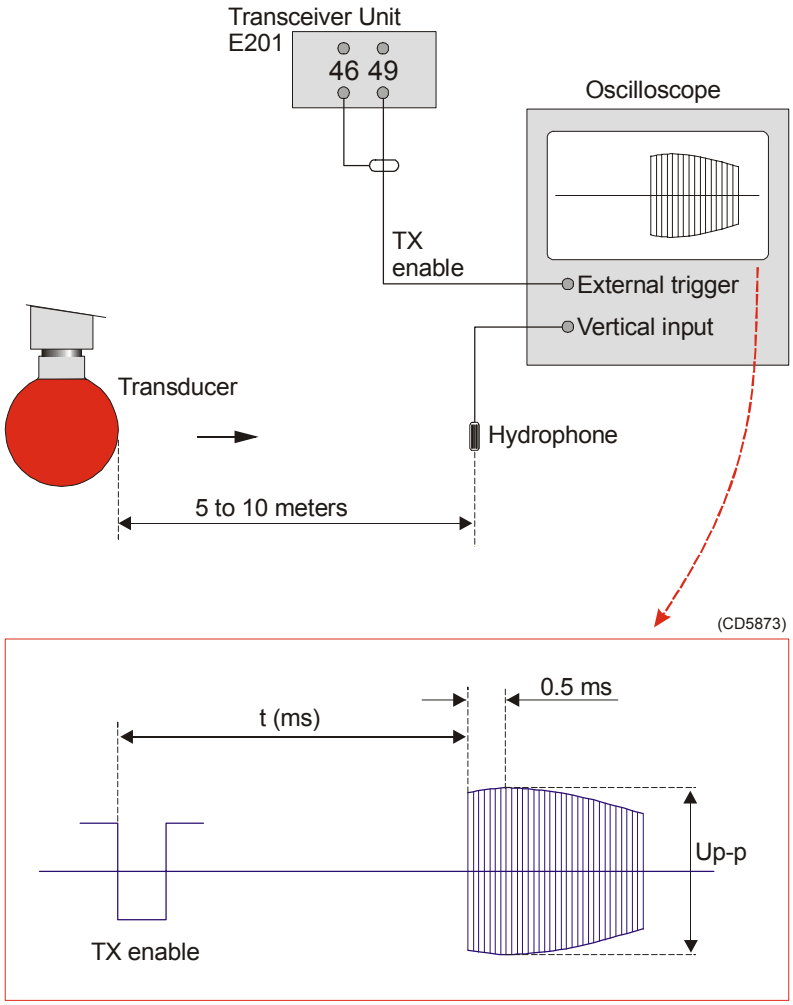


Figure 44 Source Level (SL) measurements

☐ **3** Use a weight to keep the hydrophone in a stable vertical position.

☐ **4** Lower the hydrophone and adjust the tilt on the sonar to get maximum voltage on the oscilloscope at a tilt angle of 0 degrees.

☐ **5** Measure the time delay from the negative going **TX Enable** pulse to the transmitter pulse on the oscilloscope.

☐ **6** Enter the result into the *Measurements results* table.

→ *The Measurement results table is shown as table 4 on page 141.*

☐ **7** Read the peak-to-peak value of the transmitter pulse U(p-p).

☐ **8** Enter the results into the *Measurements results* table.

→ *The Measurement results table is shown as table 4 on page 141.*

☐ **9** Access the **Horizontal** menu.

☐ **10** Push the **Ping Sector** button, and observe the **Ping Sector** submenu appear at the bottom of the menu field.

☐ **11** Select **Sector**.

☐ **12** Read the oscilloscope measurements, and use the manual training controls on the Operating Panel to obtain maximum possible hydrophone voltage.

☐ **13** Enter the bearing angle, tilt angle, depth and water temperature into the *Measurements results* table below.

→ *Refer to table 4.*

☐ **14** Make the requisite calculations in the *Measurements results* table.

→ *The Measurement results table is shown as table 4.*

☐ **15** Enter the **20 log r** and **U Hydr**. values from the *Measurements results* table into the *Source Level (SL)* table.

→ *The Source Level (SL) table is shown as table 5.*

Measurements/calculations		**Value**	**Unit**	**Example**
Measured time delay (t)			msec	5
Distance from hydrophone to transducer	r = 1.5xt		meter	7.5
	20 log r		dB	17.5
Hydrophone voltage in Omni	U(p-p)		volt	0.7
	U(RMS) = U(p-p)/2/√2		volt	0.25
	U Hydr = 20 log U(RMS)		dB//1V	-12.1
Hydrophone voltage in 11 degrees	U(p-p)		volt	1.4
	U(RMS) = U(p-p)/2/√2		volt	0.49
	U Hydr = 20 log U(RMS)		dB//1V	-6.1
General information	Bearing (° Stb/Port)		°	-36
	Tilt angle		°	0
	Depth below keel		meter	3
	Water temperature		°C	18

Table 4 Measurements results

SL = U Hydr – M + 20 log r				
OMNI	U Hydrophone		dB//1V	-12.1
	M total		dB//1V/µPa	-209.6
	20 log r		dB	17.5
	SL OMNI		dB//µPa	215.0
11°	U Hydrophone		dB//1V	-6.1
	M total		dB//1V/µPa	-209.6
	20 log r		dB	17.5
	SL 11°		dB//µPa	221.0

Table 5 Source level (SL) for Onmi and 11 degrees

☐ **16** Fill in the **M total** from the *Test hydrophone data* table into the *Source Level (SL)* table.

→ *The Test Hydrophone Data table is shown as table 3 on page 139.*

☐ **17** Perform the SL calculations as detailed in the table, and compare the result with the specifications for the sonar.

- **SL Omni:** 215 ± 2 dB//µPa
- **SL 11 degrees:** 221 ± 2 dB//µPa

Measurement termination

The Source Level measurements have now been completed.

Note

DO NOT remove the hydrophone from the position used for the source level measurements. This known position should also be used for the receiving voltage response (VR) measurements in the next chapter.

11.3 Receiving voltage response (VR)

Preparations

In order to measure the receiving voltage response, use the test hydrophone in the same position as for the previous source level measurements.

Use the following menu settings on the sonar.

1 Select the **Setup** menu.

2 Push the **Test...** button to access the **System Test** menu.

3 Push the **Test Config** button, and observe the **Test Config** submenu appear at the bottom of the menu field.

4 Select **Noise & VR** to select the menu settings for the receiving voltage response.

All the required sonar parameters for the voltage response measurements have now been set automatically.

Procedure

Observe the following procedure to measure the receiving voltage response. Note that the procedure calls for an oscilloscope and a test oscillator.

☐ **1** Check that the bearing and tilt angle values are the same as for the source level measurements.

→ *Refer to table 4 on page 141.*

☐ **2** Observe the **Echo Level** readout in the **System test** menu.

- This is the echo level which - without a signal oscillator connected - is the noise level for the selected bearing. The current value is shown on the **Echo level** button.

☐ **3** Enter the **Echo level** value into the cell for **Noise level** in the *Measurement and calculation results* table.

→ *Refer to table 6.*

☐ **4** Connect a signal oscillator to the hydrophone.

☐ **5** Adjust the oscillator frequency to 26.0 kHz.

☐ **6** Connect the oscilloscope channel to measure the output voltage to the hydrophone.

☐ **7** Adjust the oscillator voltage until the **Echo level** readout is 0.0 dB.

☐ **8** Enter the measured hydrophone voltage **U(p-p)** into the *Measurement and calculation results* table, and calculate the **U Hydr** voltage in the same table.

→ *Refer to table 6.*

Measurements/calculations		Value	Unit	Example
Noise level			dB	-25.2
Hydrophone voltage	U(p-p)		volt	0.8
	U(RMS) = U(p-p)/2√2		volt	0.28
	U Hydr = 20 log U(RMS)		dB//1V	-10.9

Table 6 Measurement and calculation results

☐ **9** Make the requisite calculations in the *Measurement and calculation results* table, and enter the result into the *Receiving voltage response (VR)* table.

→ *The Receiving voltage response (VR) table is shown as table 7.*

10 Retrieve the **Hydrophone sensitivity as transmitter S** from the *Test hydrophone data* table.

→ *The Test hydrophone data table is shown as table 3 on page 139 (Source level measurements).*

☐ **11** Enter the data into the *Receiving voltage response (VR)* table.

12 Retrieve the **20 log r** value from the *Measurements results* table.

→ *The Measurements results table is shown as table 4 on page 141 (Source level measurements).*

☐ **13** Enter the data into the *Receiving voltage response (VR)* table.

VR = ÷(S + U Hydr ÷ 20 log r)			
Data	**Value**	**Unit**	**Example**
S = S Hydrophone		dB//µPa/V	119.2
U Hydrophone		dB//1V	-10.9
20 log r		dB	17.5
VR (Voltage Response)		dB//1V/µPa	-90.8

Table 7 Receiving voltage response (VR)

14 Calculate the voltage response with the formula given in *Receiving voltage response (VR)* table.

Expected receiving voltage response is approximately:

- **VR** = -90 ±3 dB//1V/µPa

Measurement termination

The voltage response measurements have now been completed.

Remember to restore all menu settings to normal operational standard.

11.4 Noise/speed curve

Preparations

In order to make a noise/speed curve for the ship, make the following settings in the SP60 menu.

- [ ] **1** Select the **Setup** menu.
- **2** Push the **Test...** button to access the **System Test** menu.
- **3** Push the **Test Config** button, and observe the **Test Config** submenu appear at the bottom of the menu field.
- [ ] **4** Select **Noise & VR** to select the menu settings for the receiving voltage response.
- **5** Push **Close**.
- **6** Observe that the **Echo level** button in the **System test** menu provides a readout of the current value measured by the sonar.

Procedure

Observe the following procedure to make the noise/speed curve.

- [ ] **1** Start with 0 knots with the engine running.
- [ ] **2** Use the two **Train** buttons (arrows) on the Operator panel to turn the audio line to the different bearings shown in the *Noise measurements* table.

  → *Refer to table 8.*
- [ ] **3** For every new bearing, wait at least 10 seconds before you make a readout of the new echo level.
- [ ] **4** Enter the results into the table.
- [ ] **5** Increase the speed to 2 knots.
- [ ] **6** Repeat the readouts for the six different bearings.
- [ ] **7** Repeat the procedure with the different speeds and bearings shown in the table.

Speed (Knots)	Bearing					
	-120°	-60°	0°	+60°	+120°	+180°
0						
2						
4						
6						
8						
10						
12						
14						

Table 8 Noise measurements

8 When the measurements are finished, make a plot of the noise for 0 degrees bearing into the *Noise speed plot*.

- The noise level at full speed should preferably not exceed the 0 dB line.

→ *Refer to the plot provided on page 149.*

This noise/speed curve can give a picture of the ship's best search speed.

Problems with flow noise

In case of very high ship noise levels, the **RCG** function will automatically regulate the receiver gain down. This lower gain will then cause a reduction in the receiving range.

To find out if this high noise level is caused by flow noise from the vessel's hull or by the engine/propeller, perform the following test.

1 Enter the noise level for 0 degrees bearing from the *Noise measurements* table into the column for **Stable speed** in the *Noise verification* table.

→ *The Noise measurement table is given as table 8 on page 147.*

→ *The Noise verification table is given as table 9 .*

2 From 0 knots, give full engine thrust, and make a readout of the noise level for **Acceleration** when the vessel reaches each of the listed speeds. Enter the readouts into the table.

3 From full speed, reduce the engine thrust for minimum speed, and make similar readouts for **Retardation**.

Speed (Knots)	Bearing 0 degrees		
	Stable speed	Acceleration	Retardation
0			
2			
4			
6			
8			
10			
12			
14			

Table 9 Noise verification

4 Make a dashed line plot of the acceleration noise into the *Noise/speed plot*, and a dotted line for the retardation noise.

By comparing these three plots it should be possible to sort out if the main noise is caused by flow noise or engine/propeller noise.

If the main noise is caused by flow noise, the ship's hull should be thoroughly inspected during next docking. If the noise is caused by the engine propeller, ensure that the propeller is not chipped or corroded.

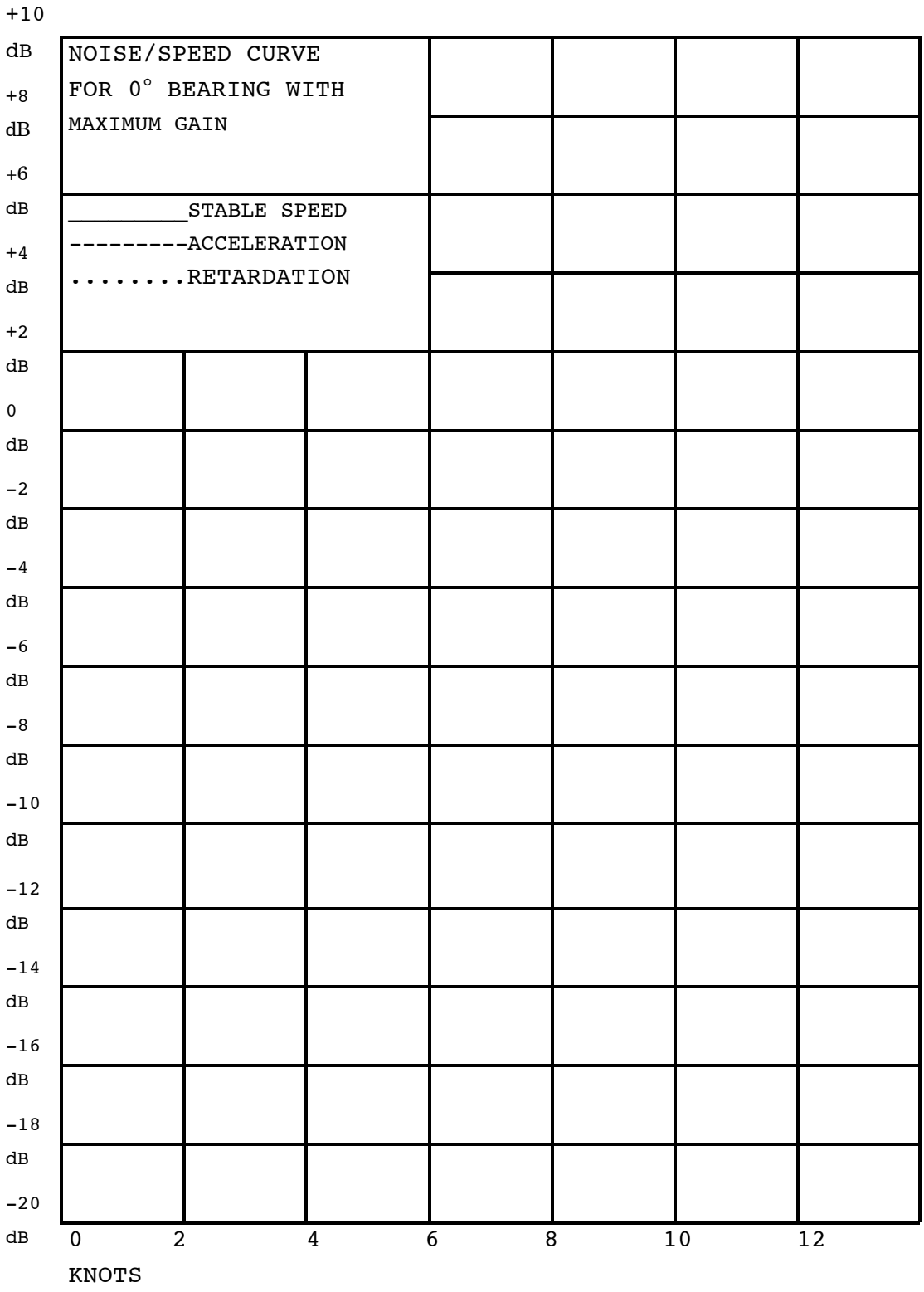


Figure 45 Noise speed plot

12 TECHNICAL SPECIFICATIONS

12.1 Power specifications

Sonar Processor Unit MC70

- **Voltage:**
  - **Nominal:** 115 / 230 Vac, single phase (selectable)
  - **Deviation:** 15 % of nominal voltage
  - **Transient:** 20 % of nominal voltage, recover time 3 s
- **Power consumption:** 150 VA
- **Frequency:** 47 to 63 Hz

Transceiver Unit

- **Voltage:**
  - **Nominal:** 115 / 230 Vac, single phase (automatic)
  - **Deviation:** 15 % of nominal voltage
  - **Transient:** 20 % of nominal voltage, recover time 3 s
- **Power consumption:** 600 VA
- **Frequency:** 47 to 63 Hz

Hull Unit

- **Voltage:**
  - **Nominal:** 230 / 380 / 440 Vac, 3-phase (selectable)
  - **Deviation, 230 Vac:** 15 % of nominal voltage
  - **Deviation, 380 / 440 Vac:** 340 to 485 Vac
  - **Transient:** 20 % of nominal voltage, recover time 3 s
- **Power consumption:** 3000 VA max
- **Frequency:** 47 to 63 Hz

Sonar Interface Unit

Not applicable.

Display Unit

Refer to the documentation for the applicable unit.

12.2 Weights and dimensions

Operating Panel

- **Weight:** Approximately 4 kg
- **Dimensions (WDH):** 385 x 165 x 58 mm

→ *Refer to drawing 834-204688 on page 188.*

Sonar Processor Unit MC70

- **Weight:** Approximately 15 kg
- **Dimensions (WDH):** 452 x 410 x 267 mm

→ *Refer to the outline dimensions drawing on page 189.*

Sonar Interface Unit

- **Weight:** Approximately 2.5 kg (with cables)
- **Dimensions (WDH):** 312 x 280 x 62 mm

→ *Refer to the outline dimensions drawing on page 190.*

Loudspeaker

- **Weight:** Approximately 0.5 kg
- **Dimensions (WDH):** 110 x 47 x 110 mm

→ *Refer to the lodspeaker outline dimensions drawing on page 192.*

Transceiver Unit

- **Weight:** Approximately 75 kg
- **Dimensions (WDH):** 520 x 505 x 750 mm (including shock absorbers)

→ *Refer to the Transceiver Unit outline dimensions drawing on page 191.*

Display Unit

Refer to the documentation for the applicable unit.

Hull Unit

- **Weight:** Approximately 530 kg
- **Dimensions:**
  - **Total height:** 2400 mm
  - **Height above trunk:** 1645 mm
  - **Flange diameter:** 580 mm

→ *Refer to drawing on page 193.*

Optional trunk

- **Weight:** Approximately 68 kg
- **Dimensions:**
  - **Total height:** 990 mm (excluding bolts)
  - **Flange diameter:** 580 mm
  - **Trunk diameter:** 508 mm

→ *Refer to drawing 830-113361 on page 194.*

12.3 Environmental specifications

Sonar Processor Unit MC70

- **Operational temperature:** 0 to +40°C
- **Storage temperature:** -40 to +70°C
- **Humidity:** 5 to 95% relative non-condensing

Sonar Interface Unit

- **Operational temperature:** 0 to +40°C
- **Storage temperature:** -40 to +70°C
- **Humidity:** 5 to 95% relative non-condensing

Transceiver Unit

- **Operational temperature:** 0 to +40°C
- **Storage temperature:** -40 to +70°C
- **Humidity:** 5 to 95% relative non-condensing

Hull Unit

- **Operational temperature:** 0 to +40°C
- **Storage temperature:** -20 to +40°C
- **Humidity:** 5 to 95% relative non-condensing

Display Unit

Refer to the documentation for the applicable unit.

12.4 Telegram formats

Introduction

The SP60 can send and receive information from several different peripherals. All transmissions take place as **telegrams** with data sentences, where each telegram has a defined format and length.

All interfaces to and from the SP60 will be described in detail in this chapter.

The table below provides an overview of the different telegrams **received** from the peripherals.

Gyro	Speed log	GPS	ITI	FS 900
$??HDM $??HDT	$??VBW $??VTG	$??GLL $??GGA $??VTG $??ZDA	@IITPT @IITPC $IIGLL $IIDBS @IIMTW @IIHFB @IIHB2 @IITDS @IITS2 @IITFI @IITTS	$??DBS
Echo sounder	**FS 3300**	**Time**	**Wind**	**Sea current**
$??DBT $SDDBS $??DBT	$??DBS	$??ZDA	$??MWD $??MWV $??VWR	$??YWP

Table 10 Overview of input telegrams

The only telegrams to be **sent to** external sensors and peripherals from the SP60, are to the ITI system.

ITI
$??TTM @SSTPP

Table 11 Overview of output telegrams

NMEA 0183

The **NMEA 0183** Standard is the most common protocol used for receiving and transmitting sensor data. The following approved sentence structure are used for all NMEA data:

$aaccc,c—c*hh<CR><LF>

For some telegrams received from other Simrad equipment, the $ character is replaced by the @ character.

According to the NMEA standard, the checksum field may not be used.

Gyro

The sonar can receive the following gyro telegrams.

- Heading, magnetic
- Heading, true

Heading, magnetic

$??HDM,x.x,M,,<cr><lf>

where (from left towards right):

Component	Content
??	Talker
HDM	identifier code for the type of system used
x.x	heading in degrees magnetic

Heading, true

$??HDT,x.x,M,,<cr><lf>

where (from left towards right):

Component	Content
??	Talker
HDT	True heading
x.x	heading in degrees relative to true north

Speed log

The SP60 can interface to an external speed log via Ethernet, or a serial line using the NMEA 0183 standard for reception of the vessel speed. The sonar will **receive** the following proprietary and standard NMEA telegrams:

- Water referenced and ground referenced speed data
- Actual course and speed relative to the ground

Water referenced and ground referenced speed data

$??VBW,-mm.mm,-nn.nn,T,-mm.mm,-nn.nn,T<cr><lf>

where (from left towards right):

Component	Content
??	Talker
VBW	Identifier code for the type of system used
mm.mm	longitude water speed (indication sign + or –)
nn.nn	transverse water speed (don't care)
T	A or V = water_track status: A=data valid, V=data invalid
mm.mm	longitude ground speed (indication sign + or –)
nn.nn	transverse ground speed (don't care)
T	A or V = bottom_track status: A=data valid, V=data invalid

Actual course and speed relative to the ground

$??VTG,x.x,T,x.x,M,x.x,N,x.x,K<cr><lf>

where (from left towards right):

Component	Content
??	Talker
VTG	Identifier code for the type of system used
x.x,T	Course, in degrees true
x.x,M	Course, in degrees magnetic
x.x,N	Speed, resolution 0.1 knots
x.x,K	Speed, resolution 0.1 km/t

Time

The SP60 software provides an interface to an external time synchronisation unit. The communication can take place via Ethernet, or on a serial line using the NMEA 0183 standard for reception of clock information.

The SP60 will **receive** the following NMEA telegram:

- Time and date

Time and date

$??ZDA,hhmmss.ss,dd,MM,yyyy,xx,xx*hh<cr><lf>

where (from left towards right):

Component	Content
??	Talker
ZDA	Time and date identifier
hhmmss.ss	Hours, minutes, seconds and tenth of seconds
dd	Date
MM	Month
yyyy	Year
xx,xx	Time zone
*hh	Check sum

Trawl systems

The SP60 interfaces a trawl system via Ethernet or on a serial line. The serial interface uses either the NMEA 0183 standard, or Simrad's version of it. In the Simrad version of NMEA telegrams, the Start Of Sentence delimiter **$** is replaced with **@**.

The following trawl systems are interfaced: ITI, FS900 and FS3300.

Note

Other telegrams than trawl may be received from the ITI, since this system may be used as a telegram router.

ITI Inputs

The SP60 can receive the following trawl telegrams from the ITI system.

- Trawl position true vessel
- Trawl position in cartesian co-ordinates
- Trawl position in latitude and longitude
- Depth of trawl below surface
- Water temperature at the trawl
- Trawl headrope to footrope and bottom
- Trawl door spread
- Trawl spread 2
- Trawl filling
- Trawl to shoal distance
- Heading, magnetic
- Heading, true

Trawl position true vessel

@IITPT,x,M,y,P,z.z,M<cr><lf>

where (from left towards right):

Component	Content
TPT	True trawl position relative to the vessel
x,M	Horizontal range to the target
y,P	Ttrue bearing to the target
z.z,M	Depth of trawl below the surface

Trawl position in cartesian co-ordinates

@IITPC,x,M,y,M,z,M<cr><lf>

where (from left towards right):

Component	Content
TPC	Trawl position in cartesian co-ordinates
x	Horizontal distance from vessel centre line
y	Horizontal distance from the transducer to the trawl along the vessel's centre line
z	Depth of the trawl below the water surface

Trawl position in latitude and longitude

$IIGLLddmm.hh,N,dddmm.hh,W,hhmmss.ss,A<cr><lf>

where (from left towards right):

Component	Content
GLL	The trawl's geographical latitude and longitude
ddmm.hh,N	Latitude in degrees, minutes and hundredths, N = North, S = South
dddmm.hh,W	Longitude in degrees, minutes and hundredths, W = West, E = East
hhmmss.ss	Time
A	Status

Depth of trawl below surface

$IIDBS,,,x.x,M,,<cr><lf>

where (from left towards right):

Component	Content
DBS	Depth of trawl below water surface
x.x	Depth in meters (0 to 2000 m)

Water temperature at the trawl

$IIMTW,-xx.x,C<cr><lf>

where (from left towards right):

Component	Content
MTW	Meteorological Temperature in the Water
xx.x	Water temperature (in degrees Celsius) measured at the trawl
C	Defines that the measurement is made in degrees celcius

Trawl headrope to footrope and bottom

@IIHFB,x.x,M,y.y,M<cr><lf>

where (from left towards right):

Component	Content
HFB	Distances from the headrope to the footrope and bottom
x.x,M	Distance from headrope to footrope
y.y	Distance from headrope to bottom

Trawl door spread

@IITDS,x.x,M<cr><lf>

where (from left towards right):

Component	Content
TDS	Trawl door spread distance
x.x,M	Distance in meters

Trawl Spread 2

@IITS2,x.x,M<cr><lf>

where (from left towards right):

Component	Content
TS2	Trawl door spread 2 distance
x.x,M	Distance in meters

Trawl filling

@IITFI,x,y,z<cr><lf>

where (from left towards right):

Component	Content
TFI	Trawl filling
x	Catch 1: 0 = Off, 1 = On, 2 = No answer
y	Catch 2: 0 = Off, 1 = On, 2 = No answer
z	Catch 3: 0 = Off, 1 = On, 2 = No answer

Trawl to shoal distance

@IITTS,x,M,y,P,z,M<cr><lf>

where (from left towards right):

Component	Content
TTS	Trawl to shoal distance
x,M	Horizontal distance from the trawl to the shoal in a direction normal to the vessel's centre line
y,M	Horizontal distance from the trawl to the shoal the direction of the vessel's centre line
z,M	Vertical distance from the trawl to the shoal

Heading, magnetic

$??HDM,x.x,M<cr><lf>

where (from left towards right):

Component	Content
??	Talker
HDM	Identifier code for the type of system used
x.x	Heading in degrees magnetic
M	Magnetic

Heading, true

$??HDT,x.x,T<cr><lf>

where (from left towards right):

Component	Content
??	Talker
HDT	Heading true
x.x	Heading in degrees relative to true north
T	True

ITI Outputs

The SP60 transmits the following NMEA telegrams to the ITI system.

- Tracked target position or marker

Tracked target position or marker

@SSTPP,xxxx,M,yyy,P,zzzz,M,nn<cr><lf>

where (from left towards right):

Component	Content
SS	Scanning sonar
TPP	Target position in polar coordinates
xxxx,M	Horizontal range to the target with resolution 1 meter
yyy,P	Bearing to the target relative to the vessel heading, resolution is 1 degree
zzzz,M	Target's depth below the surface, resolution is 1 meter
nn	Target identification: 00 = Echo target currently tracked 10 = Position currently tracked 20 to 29 = Markers 0 to 9
Position telegrams for markers will not be transmitted to the ITI.	

FS900 Trawl system

The SP60 will receive the following trawl information as an NMEA telegram from the FS900 system.

- Depth of trawl below surface

Depth of trawl below surface

$IIDBS,,,x.x,M,,<cr><lf>

where (from left towards right):

Component	Content
DBS	Depth of trawl below water surface
x.x	Depth in meters (0 to 2000 m)

FS3300 Trawl system

The serial output of the FS3300 system sends a 2-byte binary depth value. With a measurement in units of 0.1525879 m, the data format is:

Osbbbbbb bbbbbbbb

where (from left towards right):

Component	Content
O	Indicates valid output when set
s	Sign bit
b...b	14–bit absolute depth value in units of 0.1525879 m.

Global Positioning System (GPS)

The SP60 can interface an external Global Positioning System (GPS) via Ethernet or by a serial line using the NMEA 0183 standard for reception of the present vessel position. The system will assume the position to be received in WGS84 datum.

The SP60 will receive the following NMEA telegram:

- Geographical position
- Actual course and speed relative to the ground
- Global positioning system fix data
- Time and date

Geographical position

$??GLLddmm.hh,N,dddmm.hh,W,hhmmss.ss,A<cr><lf>

where (from left towards right):

Component	Content
??	Code for the system used. OM = Omega, LC = Loran C etc
GLL	Geographical latitude longitude
ddmm.hh,N	Latitude position in degrees, minutes and hundredths, N = North, S = South
ddmm.hh,W	Longitude position in degrees, minutes and hundredths, W = West, E = East
hhmmss.ss	UTC time
A	Status

Actual course and speed relative to the ground

$??VTG,x.x,T,x.x,M,x.x,M,,y.y,N,,<cr><lf>

where (from left towards right):

Component	Content
??	Talker
VTG	Identifier code for the type of system used
x.x,T	Track bearing, in degrees true
x.x,M	Track bearing, in degrees magnetic
y.y,N	Speed, with resolution 0.1 knots

Global positioning system fix data

$??GGAhhmmss.ss,ddmmhh,,N,dddmm.hh,W,hhmmss.ss,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx<cr><lf>

where (from left towards right):

Component	Content
??	Code for the system used. OM = Omega, LC = Loran C etc
GLL	Geographical latitude longitude
hhmmss.ss	UTC time
ddmm.hh,N	Latitude position in degrees, minutes and hundredths, N = North, S = South
ddmm.hh,W	Longitude position in degrees, minutes and hundredths, W = West, E = East
x	Quality factor
xx	Number of satellites in use
x.x	Horizontal dilution
x.x	Mean sea level
M	Meters
x.x	Geoidal separation
M	Meters
x.x	Age of differential GPS data
xxxx	Differential reference station

Time and date

$??ZDA,hhmmss.ss,dd,MM,yyyy,xx,xx*hh<cr><lf>

where (from left towards right):

Component	Content
??	Talker
ZDA	Time and date identifier
hhmmss.ss	Hours. minutes, seconds and tenth of seconds
dd	Date
MM	Month
yyy	Year
xx,xx	Time zone
*hh	Check sum

Echo sounder

The SP60 interfaces an external echo sounder via Ethernet or a serial line for reception of depth information. The following echo sounder telegrams can be accepted.

- Sounder depth below surface
- Sounder depth below transducer
- Depth
- Sounder depth below surface (Special)

Sounder depth below surface

$SDDBS,x.x,f,y.y,M,z.z,F<cr><lf>

where (from left towards right):

Component	Content
SD	Talker
DBS	Depth of water below surface
x.x,f	Depth in feet
y.y,M	Depth in meters
z.z,F	Depth in fathoms

Sounder depth below transducer

$??DBT,x.x,f,y.y,M,z.z,F<cr><lf>

where (from left towards right):

Component	Content
??	Accept every combination
DBT	Depth of water below transducer
x.x,f	Depth in feet
y.y,M	Depth in meters
z.z,F	Depth in fathoms

Depth

$??DPT,x.x,y.y,,<cr><lf>

where (from left towards right):

Component	Content
??	Accept every combination
DPT	Depth relative transducer
x.x	Depth in meters relative transducer
y.y	Transducer offset

Sounder depth below surface (Special)

This telegram has been developed by Simrad.

$SDDBS,,,y.y,M,,,ttttt<cr><lf>

where (from left towards right):

Component	Content
SD	Talker
DBS	Depth of water below surface
y.y	Depth in meters
ttttt	Hardness

Sea current sensor

The SP60 interfaces to an external sensor for reception of sea current data. The interface is made via Ethernet or on a serial line. Standard NMEA 0183 formats are used on the serial line.

The SP60 receives the following NMEA telegrams:

- Water propagation speed

Water propagation speed

$??YWP,x.x,f,x.x,M,<cr><lf>

where (from left towards right):

Component	Content
??	Talker
YWP	Water propagation speed
x.x,f	Speed in feets pr second
x.x,M	Speed in meters pr second

Wind sensor

The SP60 interfaces an external wind sensor via Ethernet or a serial line using the NMEA 0183 standard for reception of the wind direction and speed.

The SP60 can receive the following NMEA telegrams:

- Wind direction and speed
- Wind speed and angle
- Wind speed and angle (relative)

Wind direction and speed

$??MWD,x.x,T,x.x,M,x.x,M<cr><lf>

where (from left towards right):

Component	Content
??	Talker
MWD	Wind direction and speed
x.x,T	Wind direction, true
x.x,M	Wind direction, magnetic
x.x,N	Wind speed, knots

Wind speed and angle

$??MWV,x.x,a,x.x,a,A<cr><lf>

where (from left towards right):

Component	Content
??	Talker
MWv	Wind speed and angle
x.x	Wind angle
a	Reference: R = Relative, T = True
x.x	Wind speed
a	Wind speed units: K / M / N
A	Status: A = valid data

Wind speed and angle (relative)

$??VWR,x.x,a,x.x,a,A<cr><lf>

where (from left towards right):

Component	Content
??	Talker
VWR	Wind speed and angle
x.x	Wind angle
x.x	Wind speed, knots
N	Knots
xx	Wind speed, m/s
M	m/s
x.x	Wind speed, km/h
K	km/h

13 DRAWING FILE

13.1 Overview

This chapter contains cable details and installation drawings.

Cable details

→ *C1 - W301 AC power, page 181.*
→ *C2 - W500 VGA cable, page 184.*
→ *C3 - W301 AC power, page 181.*
→ *C4 - W206A Sonar Interface Unit Control, page 173.*
→ *C5 - W206A Sonar Interface Unit Serial, page 173.*
→ *C6 - W206B Cheapernet, page 174.*
→ *C7 - W501 Operator panel (USB), page 185.*
→ *C8 - W625 Keyboard A, page 186.*
→ *C9 - W625 Keyboard B, page 186.*
→ *C10 - W208A Loudspeaker, page 175.*
→ *C11 - W208b Serial line interfaces, page 176.*
→ *C12 - W208b Serial line interfaces, page 176.*
→ *C13 - W208b Serial line interfaces, page 176.*
→ *C14 - W208b Serial line interfaces, page 176.*
→ *C15 - W208D Control signals to transceiver, page 178.*
→ *C16 - Transducer cable*
→ *C17 - W235 Hull Unit control, page 180*
→ *C18 - W301 AC power, page 181.*
→ *C19 - W312 AC power to HLU, page 182*
→ *C20 - W208b Serial line interfaces, page 176.*
→ *C21 - W208b Serial line interfaces, page 176.*
→ *C22 - W208b Serial line interfaces, page 176.*
→ *C23 - W208b Serial line interfaces, page 176.*
→ *C24 - W400 Scientific data output, page 183.*
→ *C25 - W208F Synchronisation, page 179.*

Installation drawings

If required, certain drawings may be supplied on AutoCad format. To order, contact Simrad and refer to the drawing number in the bottom right corner of the frame.

Bridge and sonar room units

→ *Sonar Operating Panel, outline, page 188.*
→ *MC70 Sonar Processor Unit outline, page 189.*
→ *Sonar Interface Unit outline, page 190.*
→ *Transceiver Unit outline, page 191.*
→ *Loudspeaker outline, page 192.*

Hull unit, outline dimensions

→ *SP60 Hull Unit Outline, refer to page 193.*

Mounting trunk, outline dimensions

→ *SP60 Sonar Mounting Trunk, refer to page 194.*

Optional trunk, outline dimensions

None

Blind cover, outline dimensions

→ *SP60 Blind cover for the sonar trunk, refer to page 195.*

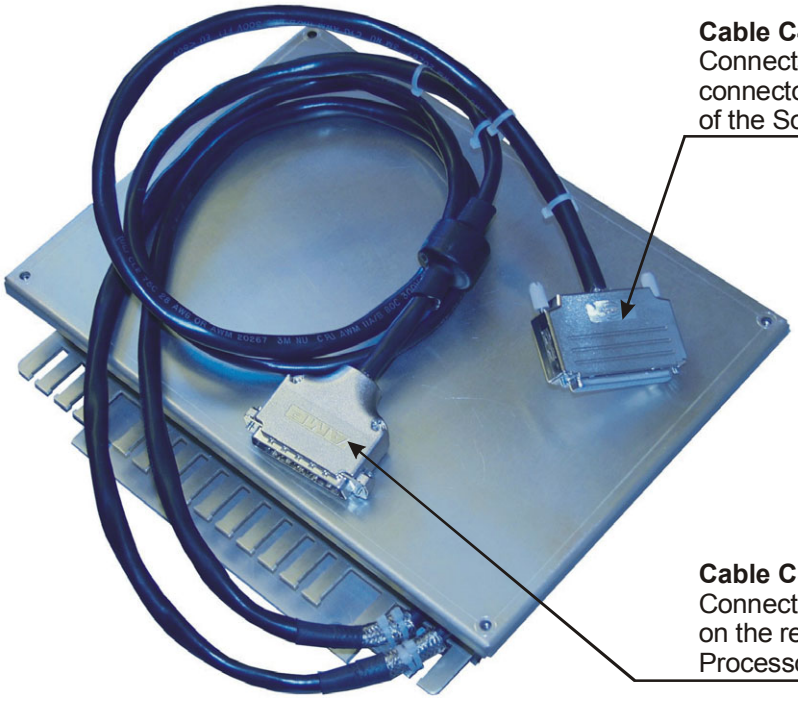
13.2 Cable details

The cable details are provided on the next pages.

Internal control and communication cables

These drawings detail the three cables used between the SP60 Sonar Processor Unit and the Sonar Interface Unit.

C4 - Control / C5 - Serial

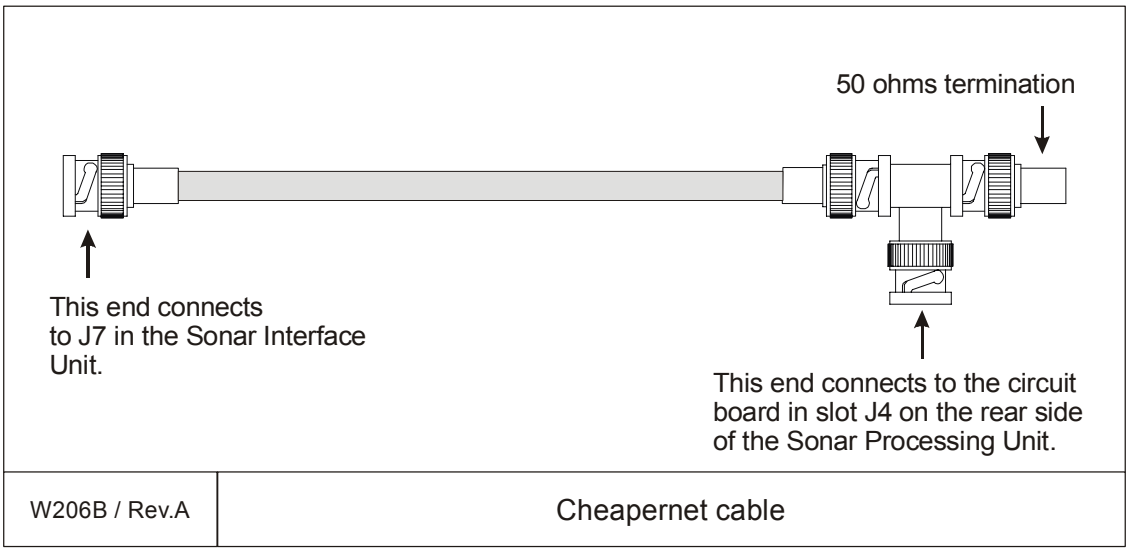

Cable C4
Connects to the far right hand connector on the rear side of the Sonar Processor Unit
Cable C5
Connects to circuit board J5 on the rear side of the Sonar Processor Unit

W206A / Rev.A	Control and Serial cables

The **C4** and **C5** cables are provided by the manufacturer. Note that the length of these cables are limited to 1.2 meters.

C6 - Cheapernet communication

This is the Cheapernet signal cable between the Sonar Interface Unit and the Sonar Processor Unit. The length is approximately 1.5 m. Note that one end of the cable is equipped with a "T-connection". This end of the cable must be connected to the Sonar Processing Unit.

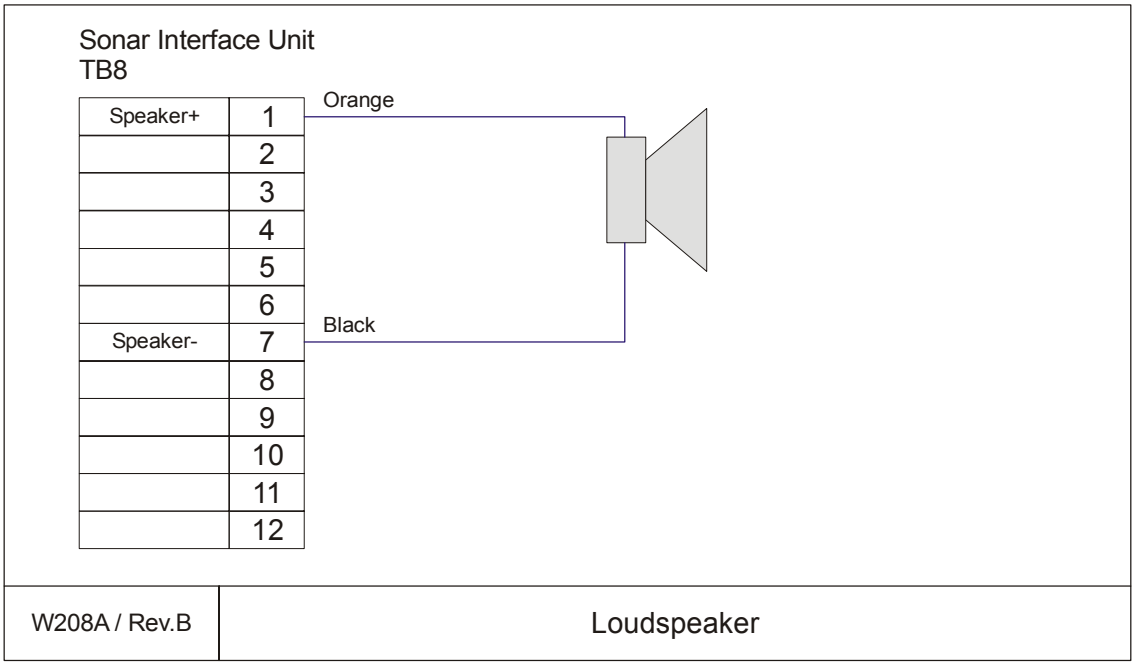

50 ohms termination
This end connects to J7 in the Sonar Interface Unit.
This end connects to the circuit board in slot J4 on the rear side of the Sonar Processing Unit.
W206B / Rev.A
Cheapernet cable

The **C6** cable is provided by the manufacturer.

Sonar Interface Unit

Loudspeaker

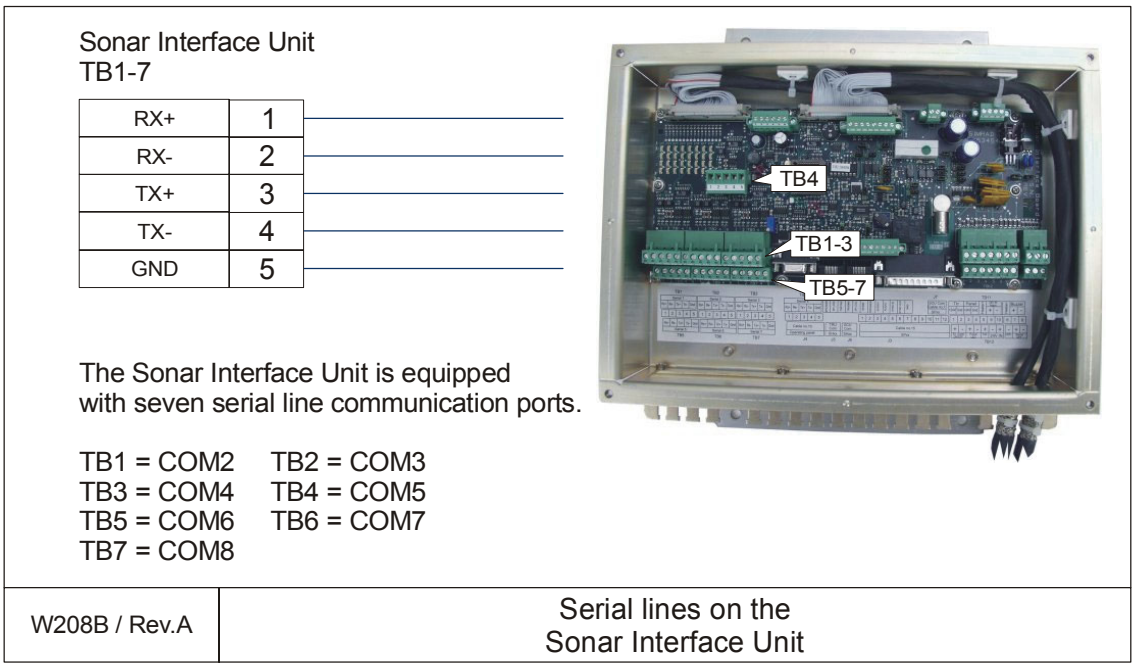
The loudspeaker cable is physically connected to the loudspeaker unit, and as such a part of the delivery.



W208A / Rev.B	Loudspeaker

Serial lines

The Sonar Interface Unit provides seven serial line communication ports. These are available on terminal blocks TB1 through TB7, and all are identical.



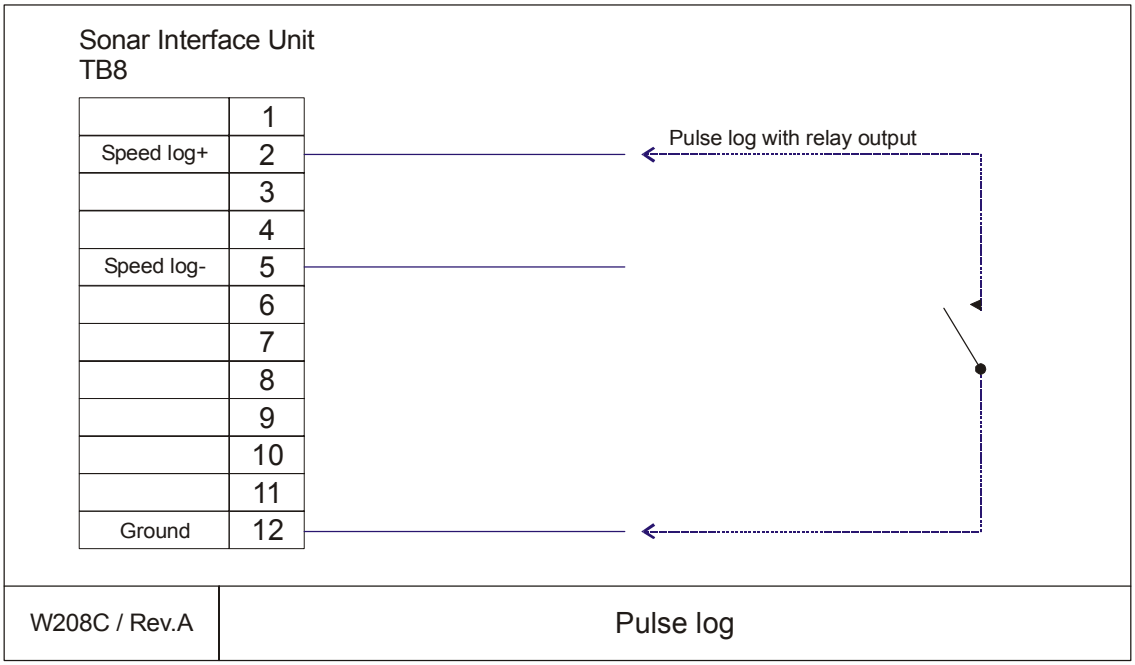
W208B / Rev.A	Serial lines on the Sonar Interface Unit

These cables are not included with the delivery, and must be provided by the installation shipyard.

Conductors	5 x 0.5 mm2
Screen	Overall braided
Voltage	60 V
Max.diameter	Set by the plugs

Pulse speed log

This interface has been provided for a pulse speed log.

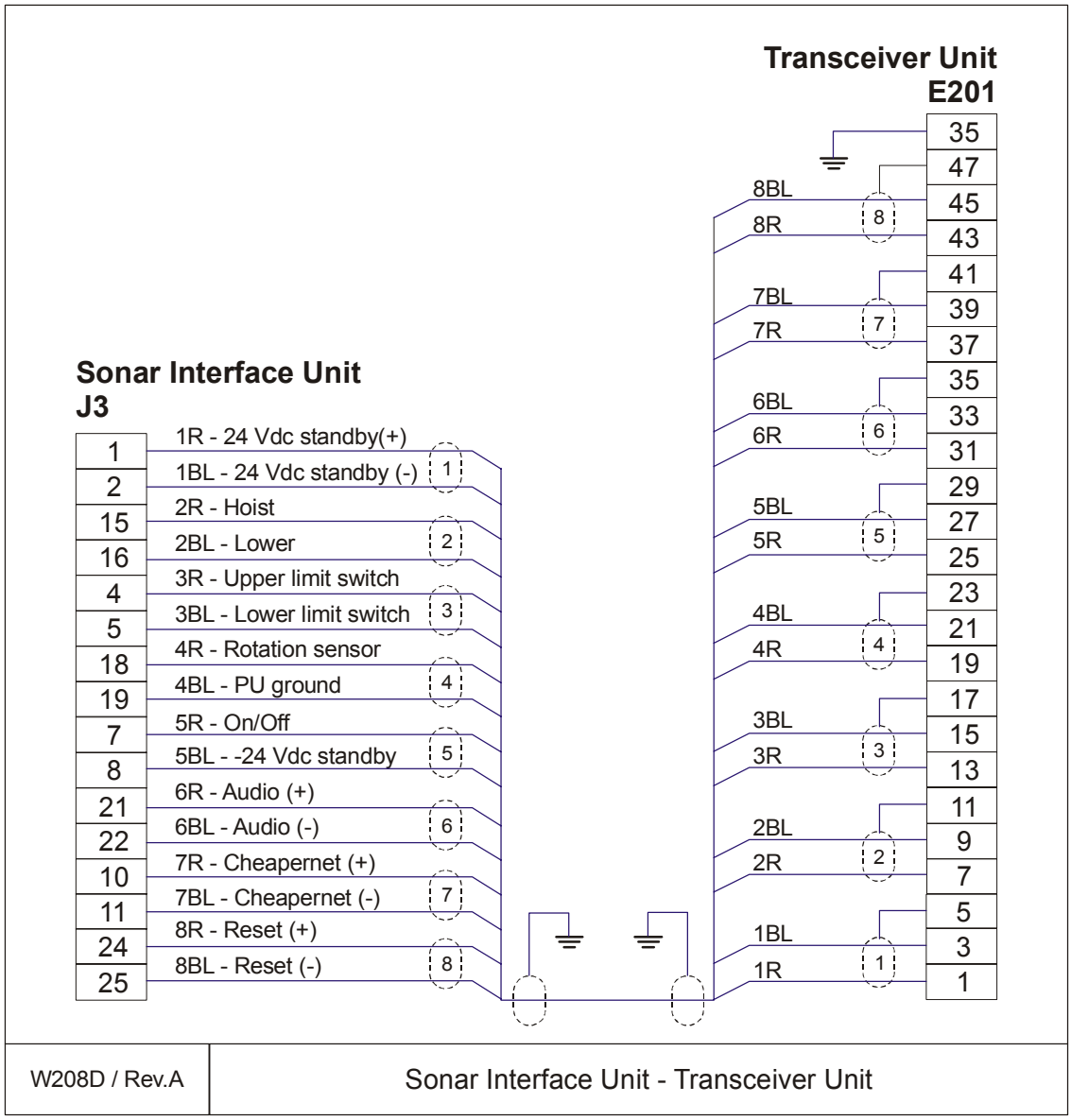


These cables are not included with the delivery, and must be provided by the installation shipyard.

Conductors	2 x 0.5 mm2
Screen	Overall braided
Voltage	60 V
Max.diameter	Set by the plugs

C15 - Transceiver Unit interface

This is the main interconnection cable between the Sonar Interface Unit and the Transceiver Unit in the sonar room. The connection to the Sonar Interface Unit is made with the pre-fitted 25-pin Delta connector, which connects to **J3**. The connection to the Transceiver Unit is made on terminal block **E201**.

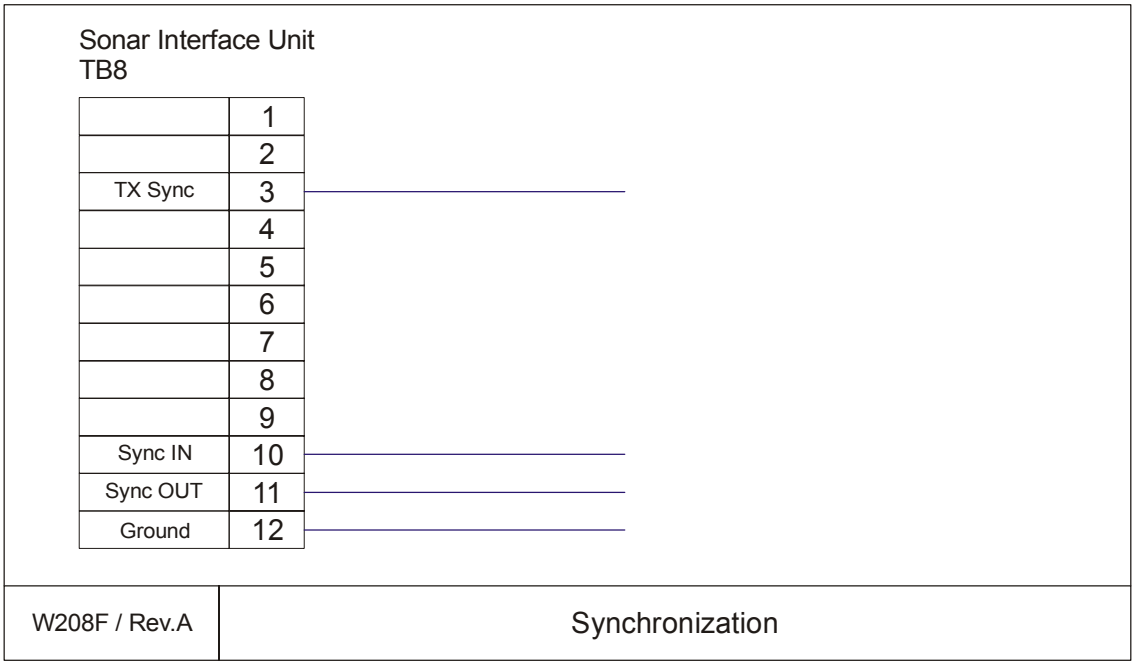

Transceiver Unit
E201
Sonar Interface Unit
J3
1R - 24 Vdc standby(+)
1BL - 24 Vdc standby (-)
2R - Hoist
2BL - Lower
3R - Upper limit switch
3BL - Lower limit switch
4R - Rotation sensor
4BL - PU ground
5R - On/Off
5BL - -24 Vdc standby
6R - Audio (+)
6BL - Audio (-)
7R - Cheapernet (+)
7BL - Cheapernet (-)
8R - Reset (+)
8BL - Reset (-)
1 2 15 16 4 5 18 19 7 8 21 22 10 11 24 25
35 47 45 43 41 39 37 35 33 31 29 27 25 23 21 19 17 15 13 11 9 7 5 3 1
8BL 8R 7BL 7R 6BL 6R 5BL 5R 4BL 4R 3BL 3R 2BL 2R 1BL 1R
8 7 6 5 4 3 2 1

W208D / Rev.A	Sonar Interface Unit - Transceiver Unit

The cable is provided by the manufacturer.

Synchronization

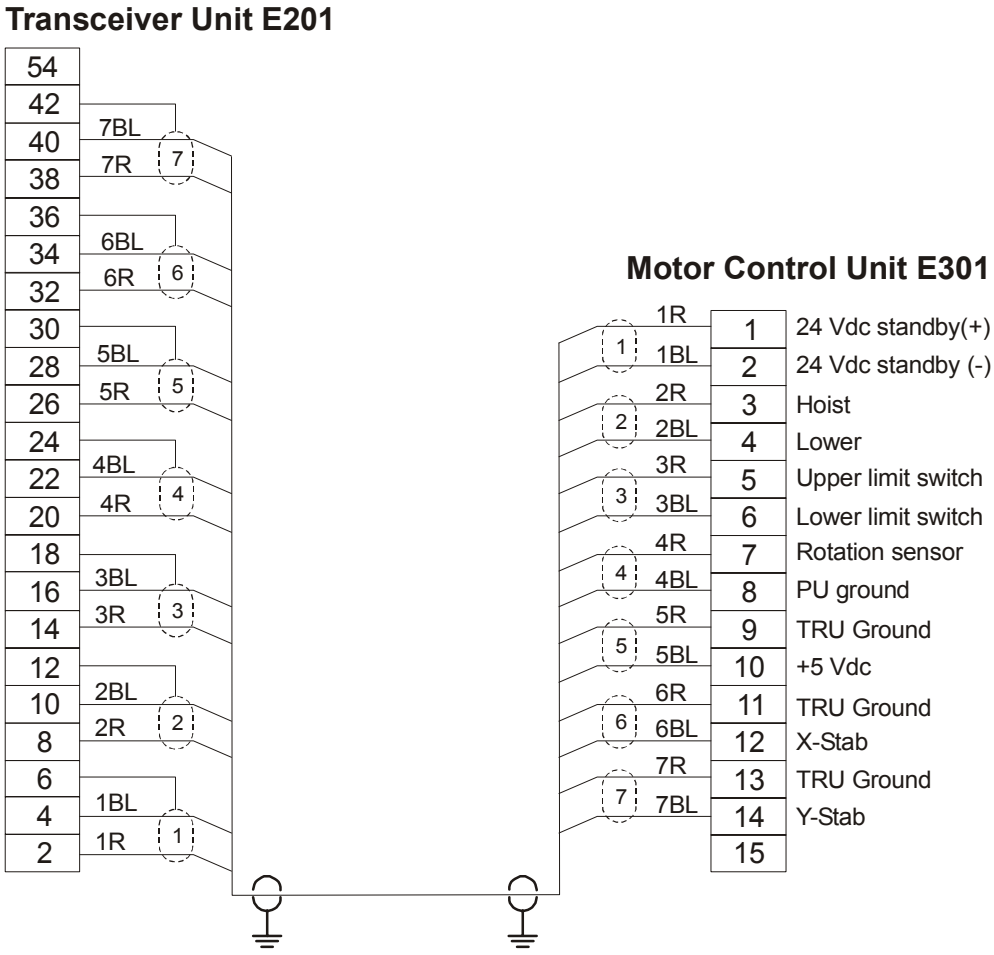
This cable allows external synchronization of the sonar's transmission.



Conductors	4 x 0.5 mm2
Screen	Overall braided
Voltage	60 V
Max.diameter	Set by the plugs

Transceiver Unit to Motor Control Unit

This is the main intercommection cable between the SP60 Transceiver Unit and the Motor Control Unit on the Hull Unit. The connections to both the Transceiver Unit and the Motor Control Unit are made on terminal blocks.

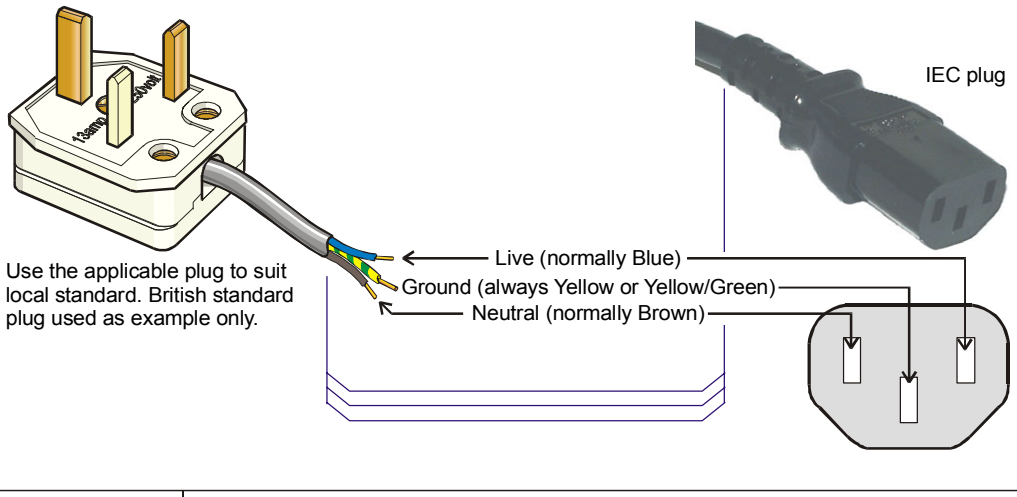


W235 / Rev.A	Transceiver Unit - Motor Control Unit

Conductors	8 x (2+1) x 0.5 mm2
Screen	Overall braided
Voltage	60 V
Max.diameter	14 mm

Standard AC power cable

This cable is a standard three-wire power cable. It is commercially available in standard lengths, or may be produced locally to suit the specific installation needs. The instrument end is terminated in a standard IEC female socket, while the other end is terminated in a plug suitable for the local standard.


IEC plug
Use the applicable plug to suit local standard. British standard plug used as example only.
Live (normally Blue)
Ground (always Yellow or Yellow/Green)
Neutral (normally Brown)

W301 / Rev B	Standard power cable for 115/230 Vac 2-phase

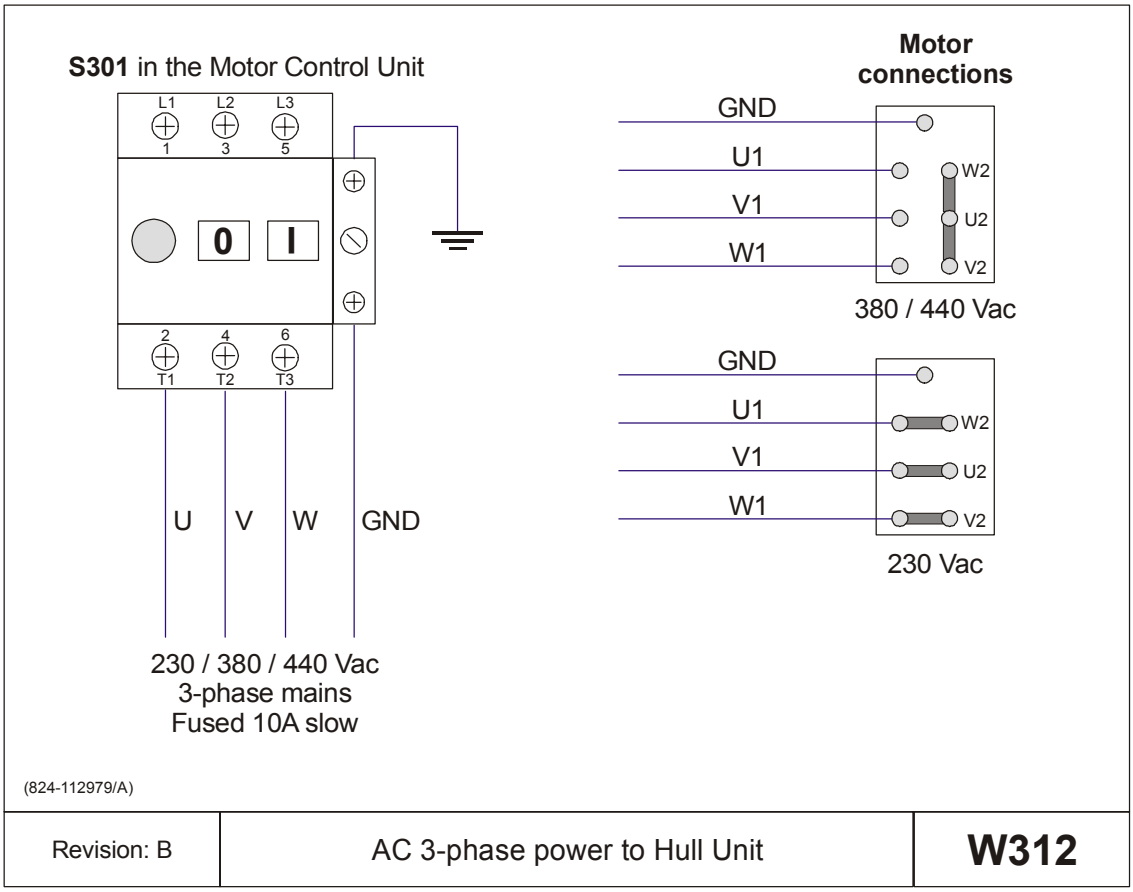
Note

Different cable colours may be used for the "live" and "neutral" wires. Ground is however always on green/yellow.

Conductors	2 x 1.5 mm^2 + GND
Screen	None
Voltage	750 V
Max. diameter	Set by the plugs

Power to Hull Unit

This cable is used to connect AC power to the Motor Control Unit, and thus also to the hull unit's hoist motor. The drawing also illustrates how to set up the motor connections to match the power available.

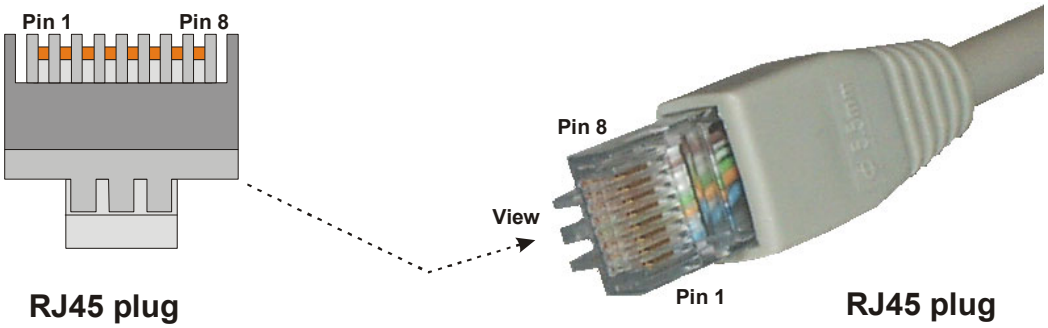


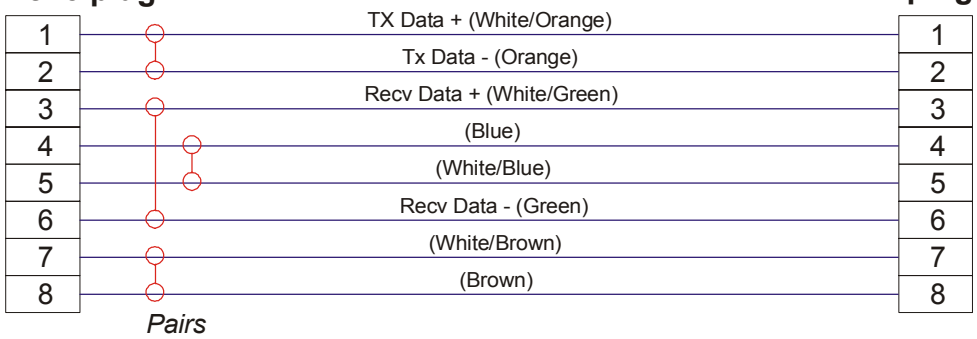
Revision: B	AC 3-phase power to Hull Unit	**W312**

Conductors	3 x 2.5 mm2
Screen	Seperate conductor, 2.5 mm2
Voltage	750 V
Max.diameter	17 mm

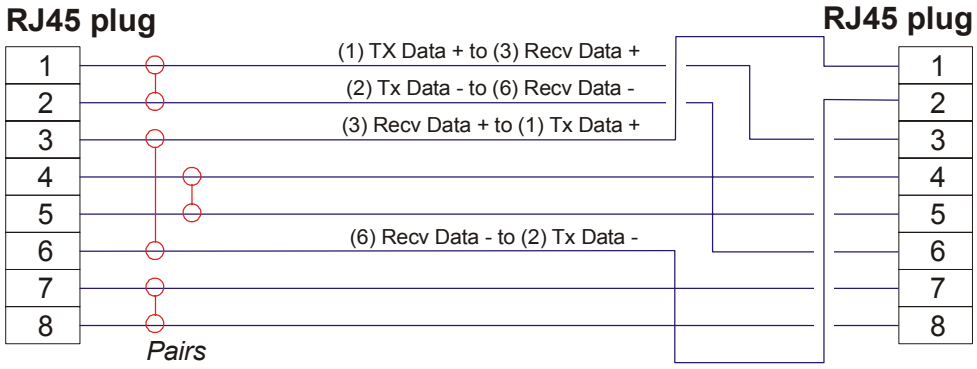
Ethernet with RJ45

This cable contains the Ethernet connection. RJ45 plugs are used to terminate the cable. Note that these plugs must be screened to comply to EC rules.





Ethernet 10Base-T "Straight Through"



Ethernet 10Base-T "Crossover"

NOTE: In order to prevent noise and crossover, you are strongly adviced to use the cable pairs indicated above.

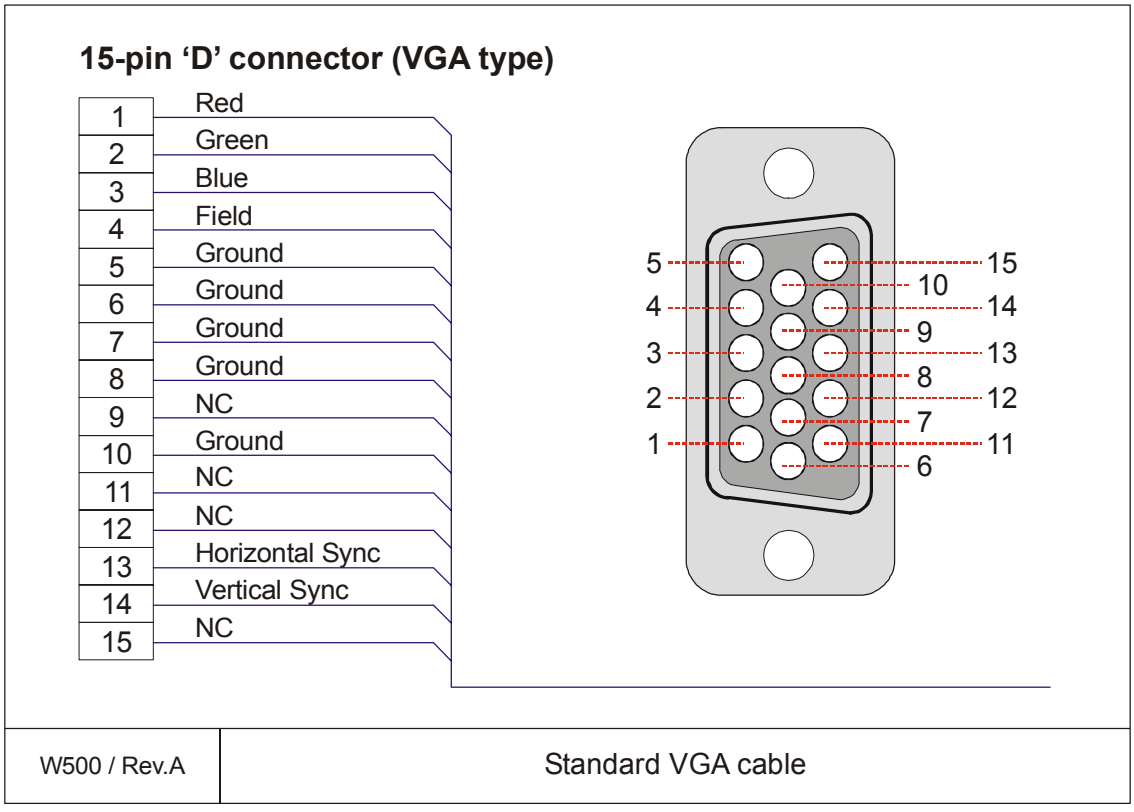
The "crossover" cable is used to cascade HUBs, or for connecting two ethernet stations or computers back-to-back without a HUB)

W400 / Rev E	Ethernet 10Base-T with RJ45 plugs

Standard VGA cable

This is a standard display cable used to connect the video signals.

The cable is normally physically fastened to the display unit, and it is provided with the plug(s) readily attached.



W500 / Rev.A	Standard VGA cable

Standard USB cable

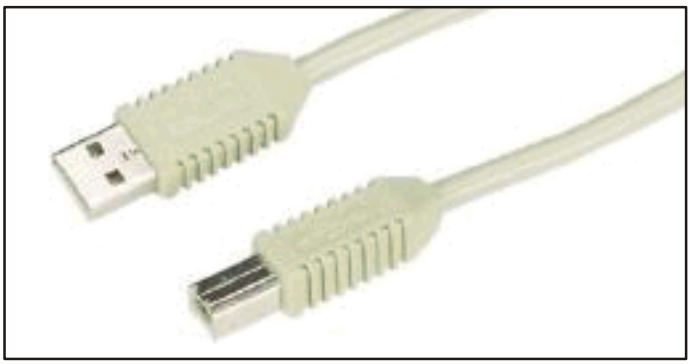
This is a standard commercial USB cable terminated with **A** and **B** plugs in either ends. The cable can be used for most kind of external devices.

The order number provided is for a 4.5 m cable.

Universal Serial Bus (USB) cable
terminated with an **A-plug** in one end
and a **B-plug** in the other.

Internal cables:
Pair 1:
28 AWG twisted pair
(data, green, white)
Pair 2:
20 AWG twisted pair
(Power, red, black)
Shield:
Foil and braid

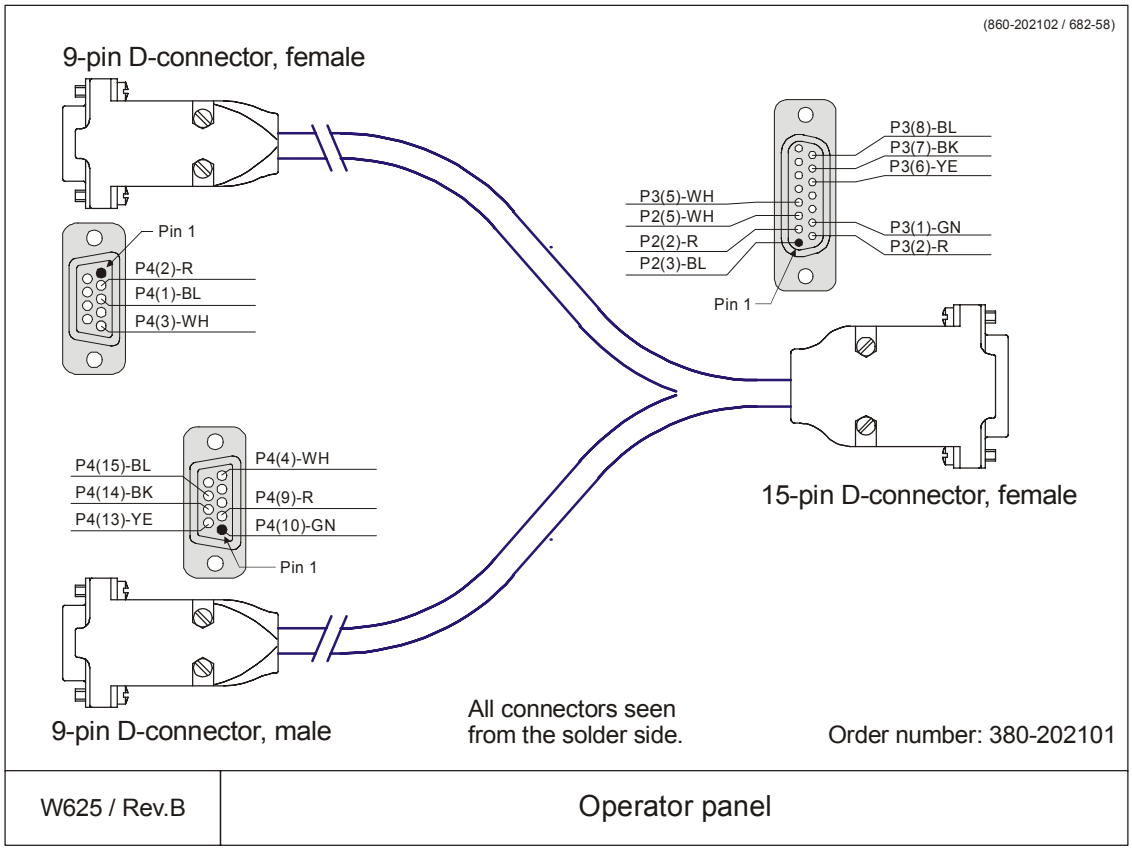
Length: 4.5 m
Order no: 719-078524



W501 / Rev.A	Commercial USB cable

Operator panel

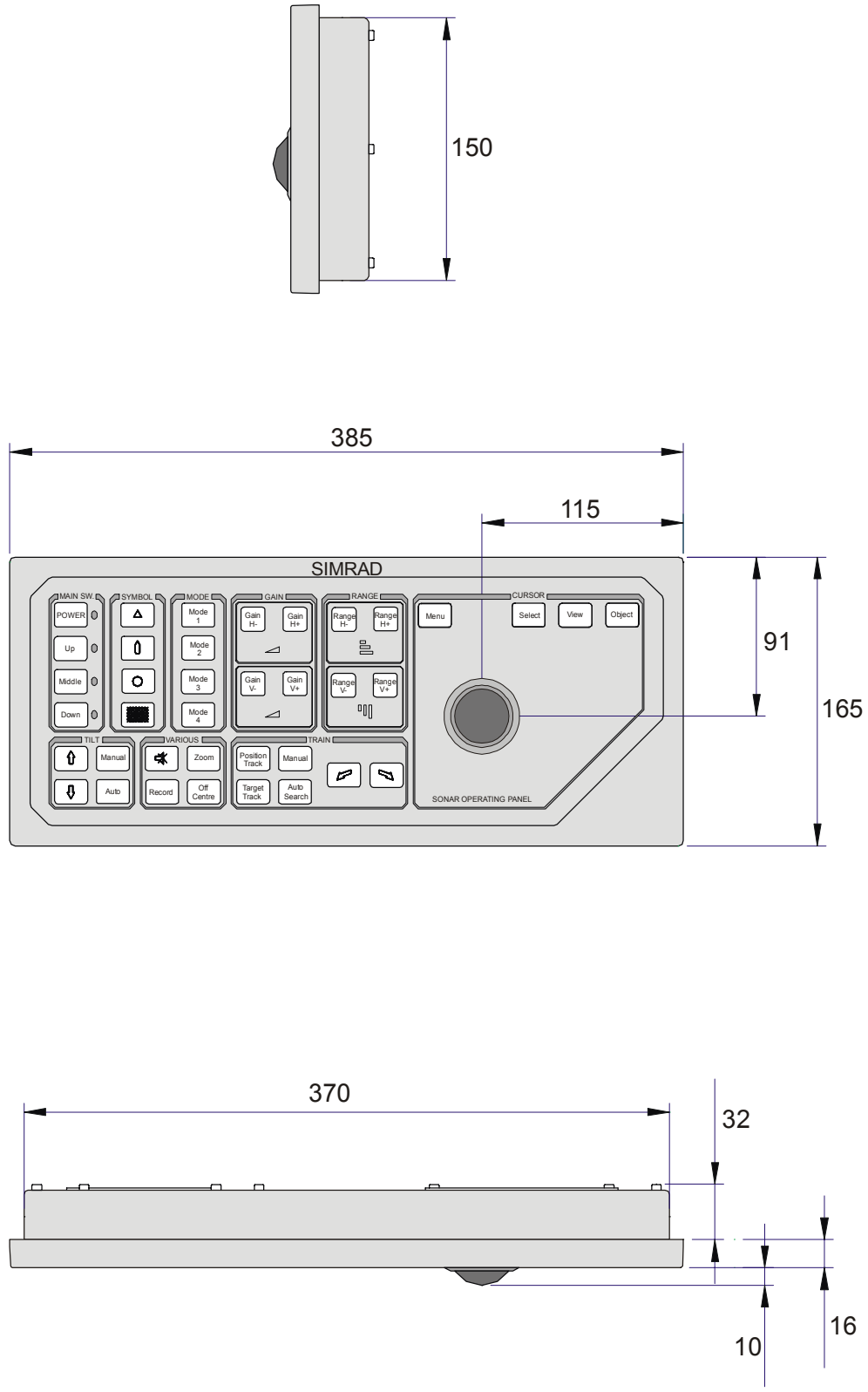
This cable is used to connect the Operator Panel to the Sonar Processor Unit and Sonar Interface Unit. The cable is provided by the manufacturer.



W625 / Rev.B	Operator panel

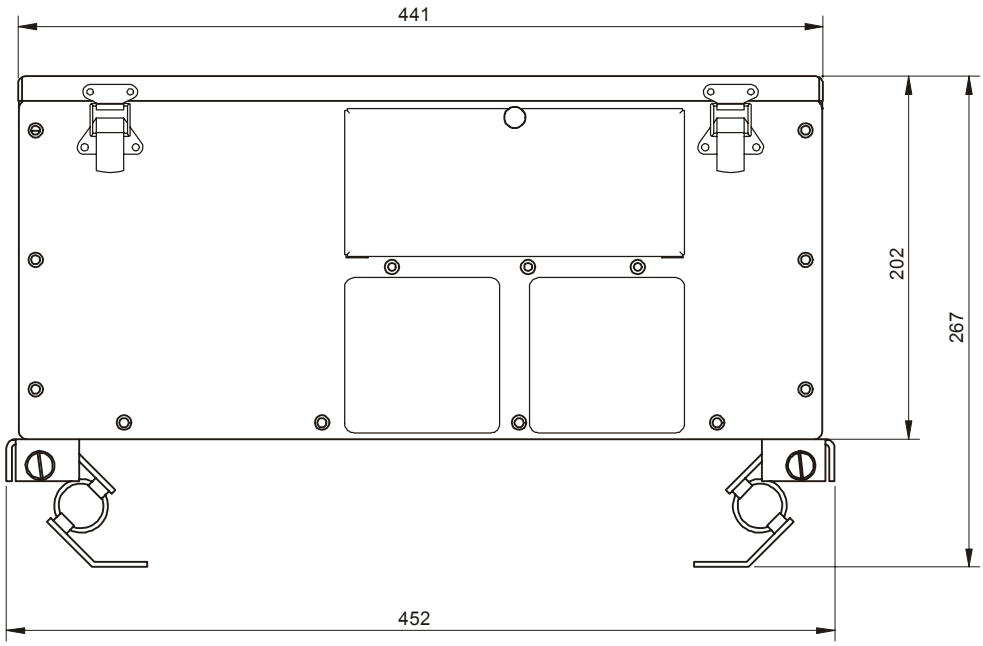
13.3 Installation drawings

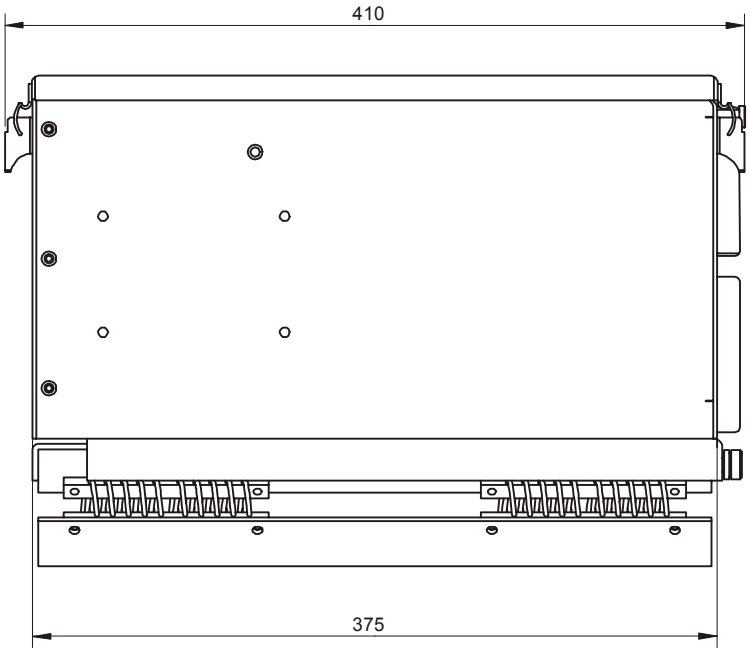
The SP60 installation drawings are provided on the next pages.



All measurements in mm.
The drawing is not in scale.

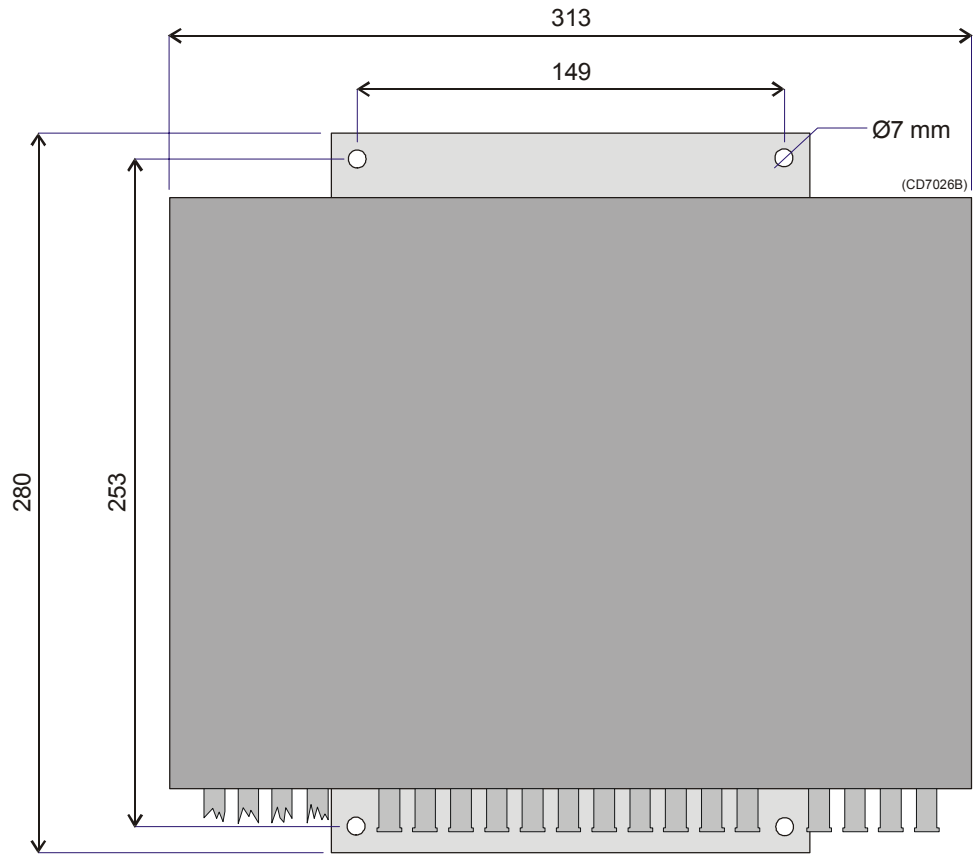
Page 1 of 1 (CD5862)	Sonar Operating Panel Outline dimensions	**834-204688** Rev.A





Note:
All measurements are in mm.
The drawing is not in scale.

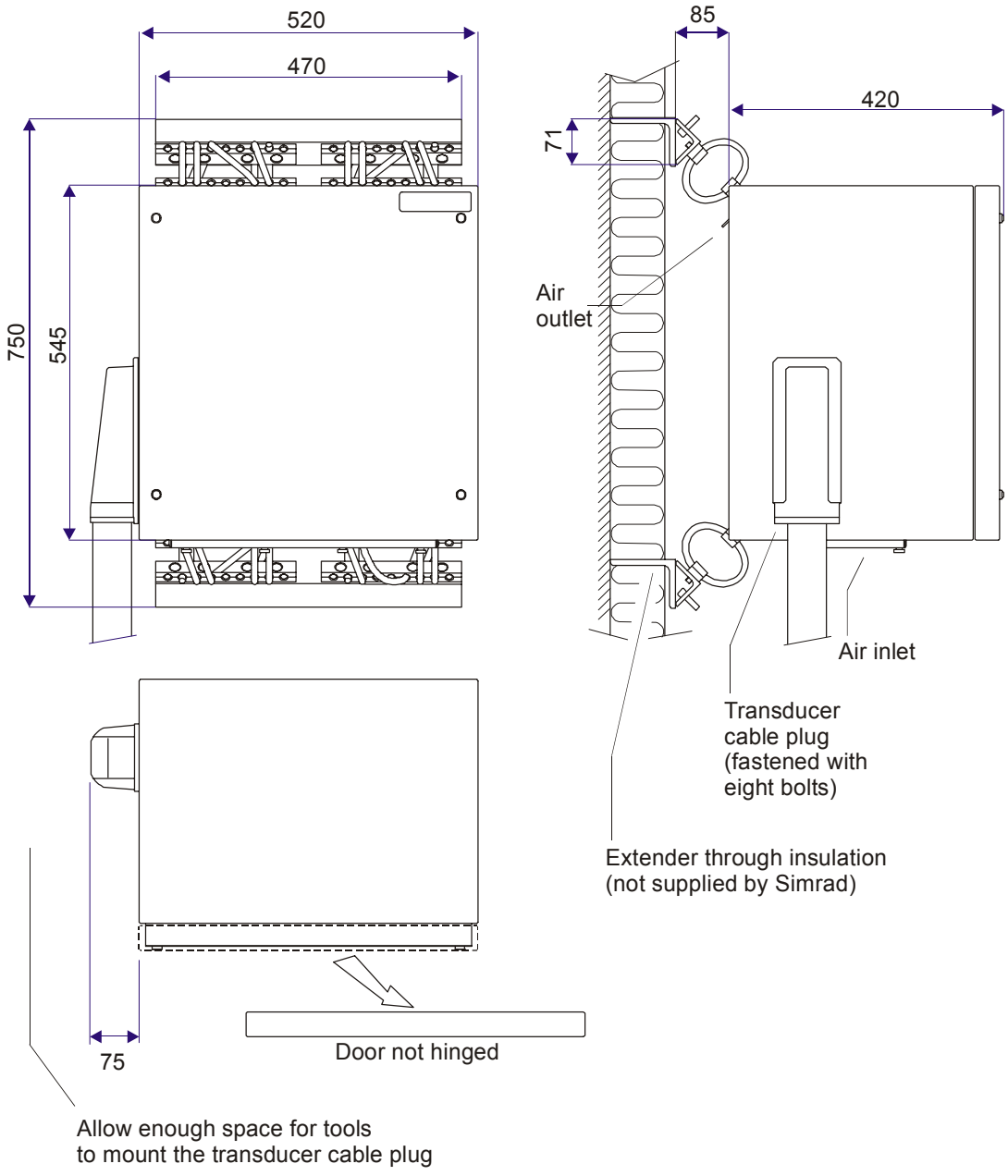
Page 1 of 1 (CD7006A)	MC70 Sonar Processing Unit Outline dimensions	**N/A** Rev.A



Allow access space underneath the unit for the cables.

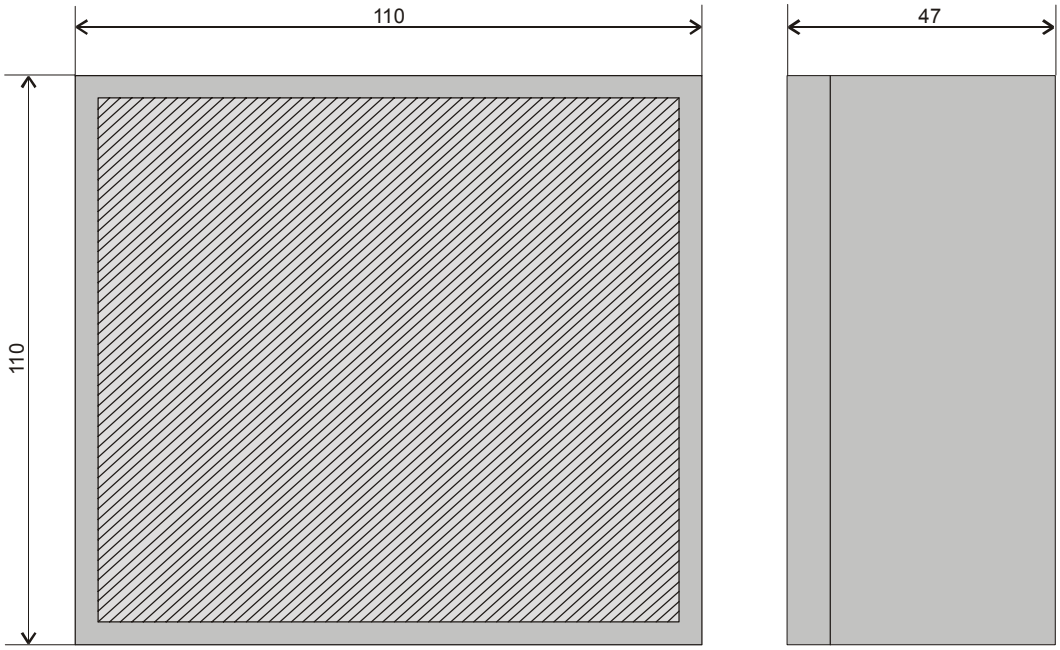
Note:
All measurements are in mm.
The drawing is not in scale.

Page 1 of 1 (CD7026B)	Sonar Interface Unit Outline dimensions	**N/A** Rev.A



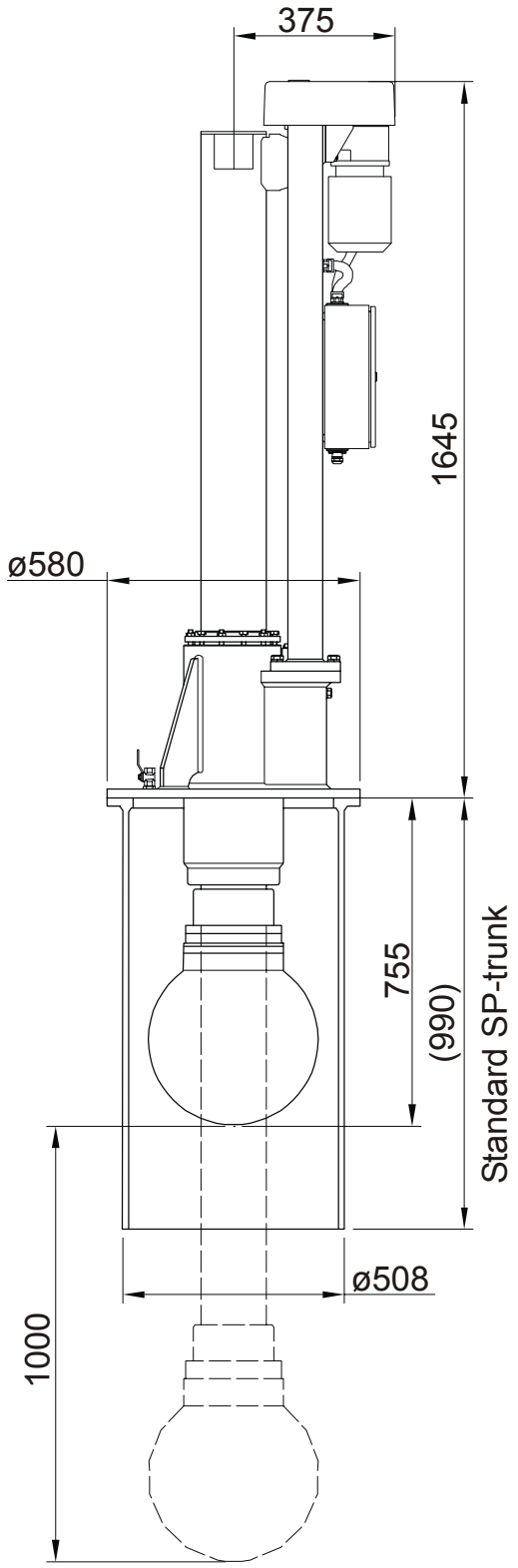
All measurements are in mm.
Note that the drawing is not in scale.

Page 1 of 1 (CD5858)	Transceiver Unit Outline dimensions	**TBD** Rev.A



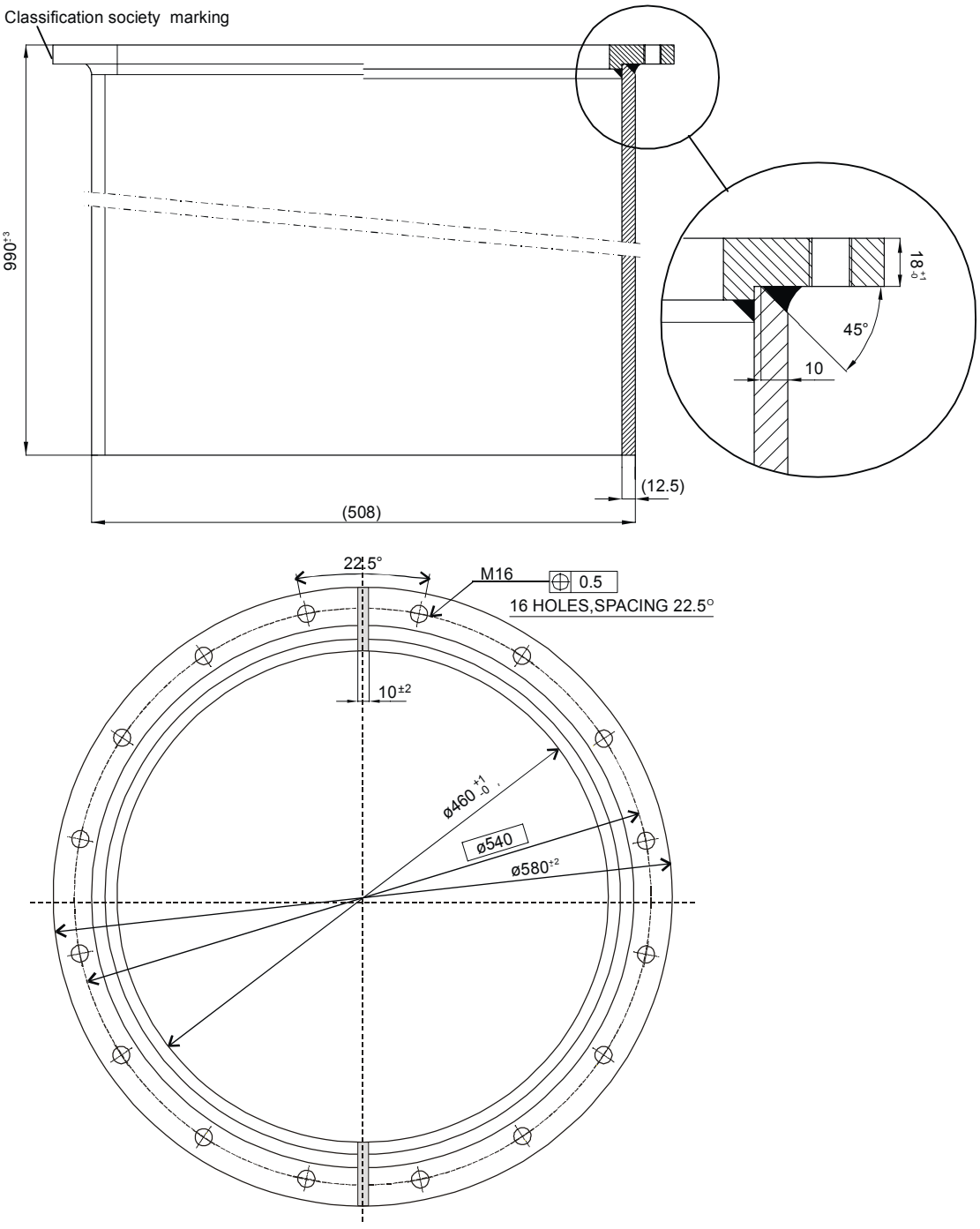
All measurements in mm.

Page 1 of 1 (CD6366B)	Standard loudspeaker Outline dimensions	**TBD** Rev.A

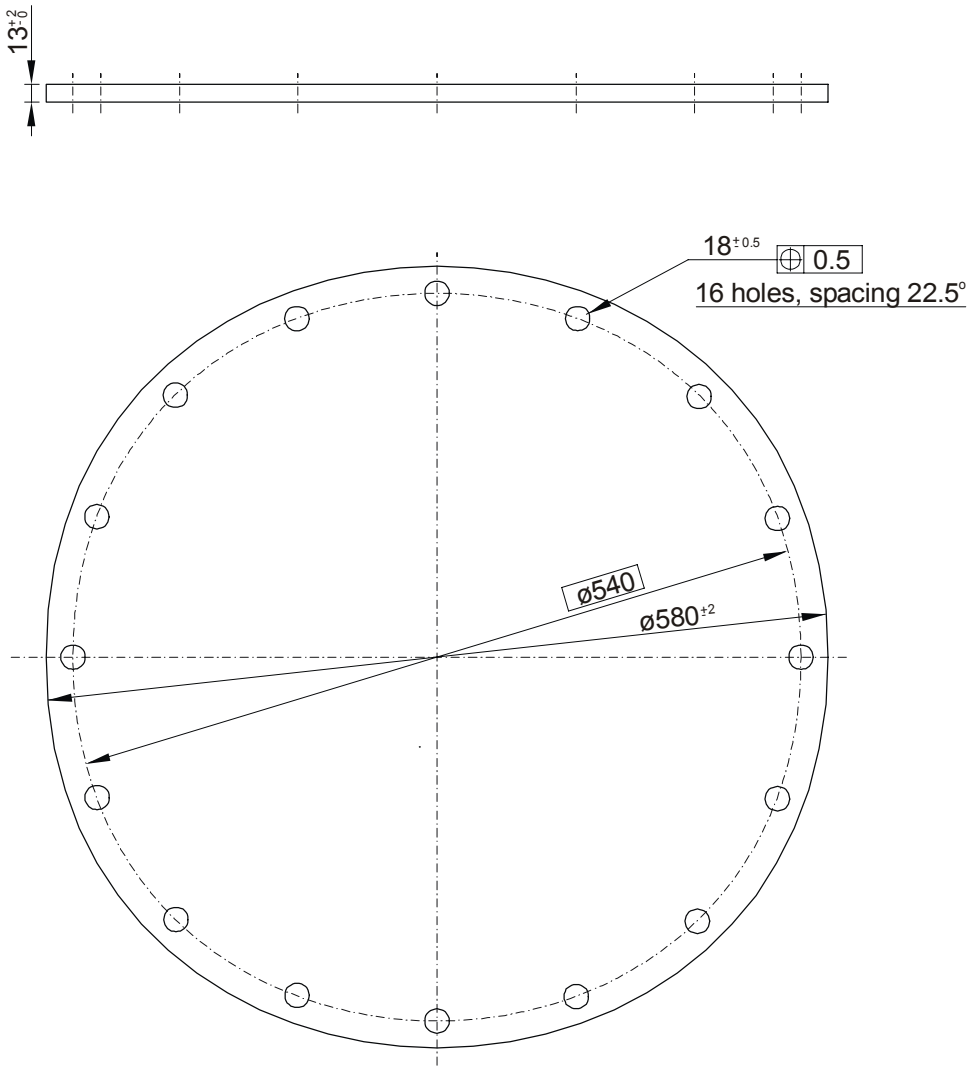


All measurements in mm. The drawing is not in scale.

Page 1 of 1 (CD6243)	SP60 Hull Unit Outline dimensions	**TBD** Rev.A



Page 1 of 1 (CD5859)	Sonar mounting trunk	**830-113361** Rev.A



Page 1 of 1 (CD5846)	Blind cover for sonar trunk	**830-113362** Rev.A

14 INSTALLATION REMARKS

Use these pages to document comments and remarks concerning the installation. When the installation has been fully completed, and all functional tests have been perfomed to full satisfaction, representatives from all parties concerned must sign on the next page.

Notes

Notes

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